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Editor: E. T. Hockings.

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Tuberculosis-Free Cattle Herds. (As at 1st December, 1957).

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(As at 1st December, 1957).

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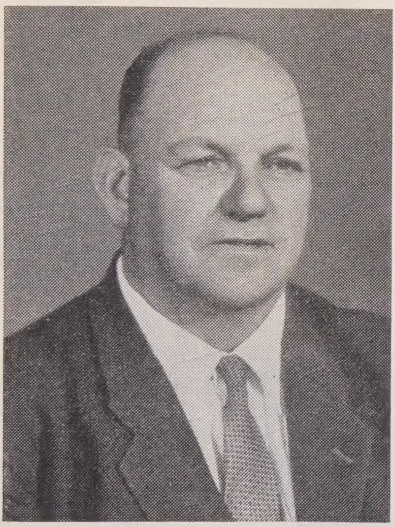
NEW YEAR MESSAGE FROM THE MINISTER FOR AGRICULTURE AND STOCK.

To the many Queensland primary producers badly hit by drought I should like to extend my sympathy. I sincerely hope that their recovery from the past year's severe seasonal setback will be swift and complete.

The dry weather struck calamitous blows at the dairyman particularly, but even so there were some who had conserved water and fodder, and these fortunate ones triumphed over hardship. The Department of Agriculture and Stock is ever willing to offer all the help it can to those seeking ways of solving drought and other problems.



My Department is aware of the plight of the producer who, each time he looks over his shoulder, sees another economic conundrum raise its mushroom head. And so, with this growing importance of the business side of rural industry, work is being undertaken to give co-operation and aid.

There is still with us the spiral of production costs. These have risen 25 per cent. in Australia in the past five years, while other countries' costs have been levelling out. In order that we may retain a footing on the slippery floor of the world's markets, our cost rises will have to be checked, and in this task I believe Governments, farm organisations and departments should co-operate to the utmost.

The staff of my Department has the fixed ideal of service to the primary producer. To get the best results from this service my officers welcome the interest of the progressive producer.

I extend my best wishes for a successful 1958 to all on the land.

Otto Madsen

Cane Windbreaks Improve Quality of Papaws

By J. B. DAVEY, Experimentalist.

Cane windbreaks will help to improve the quality of papaws in Southern Queensland. Two-row strips of cane can be grown to protect papaws from cold winds, and later the cut cane can be used as a surface mulch.

Quality in the papaw fruit depends on many characteristics such as size, degree of maturity, external and internal colour, incidence of skin blemishes, flesh thickness and texture, flavour and palatability.

Papaws for both the fresh fruit trade and most types of processing should be yellow to orange in external colour with a minimum of green and few blemishes on the skin. Internally, the flesh should be firm, thick and uniformly yellow to orange in colour; it must also be smooth in texture and highly palatable (Plate 1).

The papaw is essentially a tropical plant. In its country of origin—Central America—high temperatures and a well distributed rainfall lead to that continuity of growth which is essential for satisfactory development of the crop. Marked variations in seasonal conditions are usually reflected in the production of poor quality fruit.

Crop Spread.

Since the papaw first attracted attention in the 15th century, the plant has been introduced to most tropical and sub-tropical countries. Some of these experience relatively low temperatures during the winter months. This is the case in south-eastern Queensland even though proximity of the main producing districts to the sea ameliorates the climate somewhat.

Low temperatures retard flower and fruit development. At the peak of flowering in the December to early March period an average of 3-4 flowers are produced each week but, as temperatures drop in late March and April, the number of flowers developing becomes progressively less until the end of May when flowering ceases for the time being.

This pattern of flowering is reflected in the harvest which, in normal seasons, commences in April, reaches peaks in June-July and in October-November, and terminates in late January. The gap between the two more or less definite peaks is due to erratic pollination of flowers which open during the normally wet month of February.

Table I, which is extracted from data collected in a varietal trial at the Redlands Experiment Station, indicates the pattern of harvesting over the year.

TABLE 1.

NUMBER OF FRUIT HARVESTED.

Variety.	April–June.	July–September.	October–December.	January.	Total.
Hybrid No. 5	203	220	370	177	970
Hortus Gold	107	128	198	94	527
Sunnybank	169	230	609	146	1,154
Brookfield	127	165	248	133	673

In this trial, the relatively heavy "pick" recorded late in the year can be attributed to better-than-average conditions towards the end of the flowering period; in autumn, air temperatures were relatively high and soil moisture was more than sufficient for the trees.

Leaf Fall.

Winds influence fruit quality. In south-eastern Queensland, strong

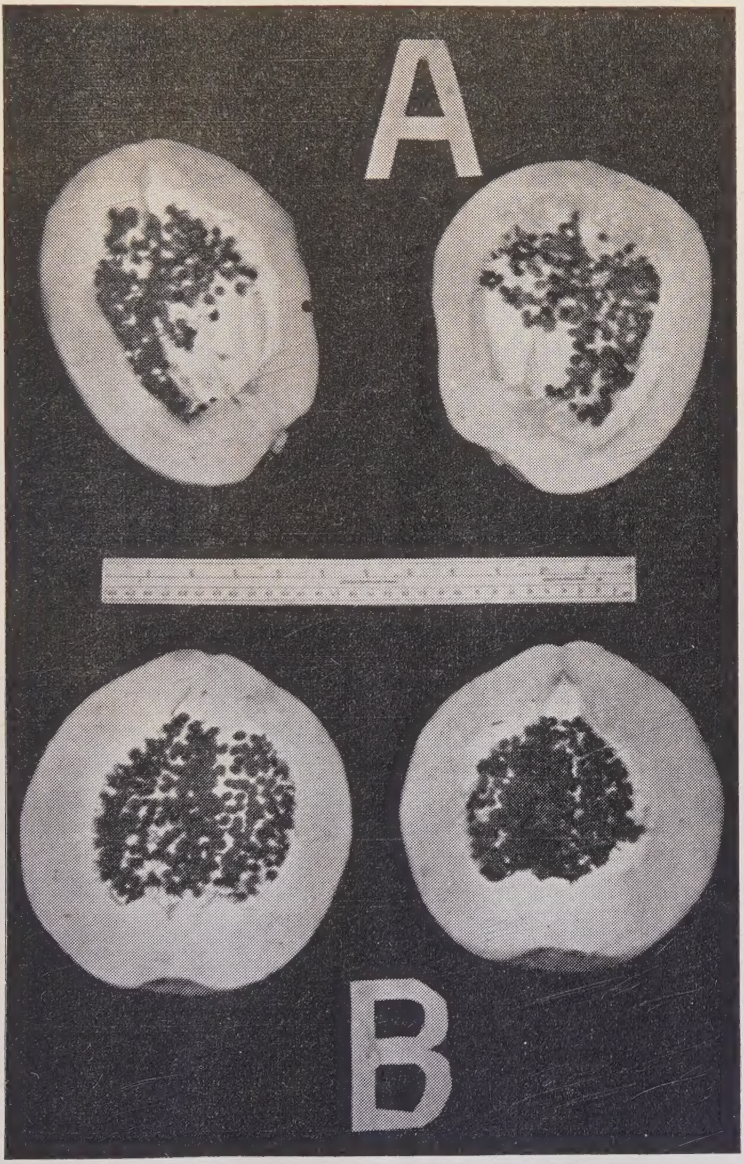


Plate 1.

Good Quality and Thickness of Papaw Flesh is Associated with Adequate Pollination. A shows poor pollination; B shows satisfactory pollination.

south-easterly winds, cold westerlies and hot north to north-westerly winds are all detrimental to the crop. Of these, the cold westerlies which usually occur in July and August are by far the most harmful.

Primarily, the main effect is loss of leaf. This can be considerable at times and it is not uncommon at certain periods of the year to see whole papaw plantations with few leaves on the trees, other than small tufts of under-developed crown leaves below which the fruit is fully exposed to the elements (Plate 2).

A secondary effect, and perhaps the more important, is the increased susceptibility of the exposed fruit to ripe fruit rots. These are unsightly lesions of various sizes on the surface of the maturing fruit. In their mildest form they merely detract from the appearance of the fruit, but in severe cases, the fruit is unsaleable.

Flavour.

The flavour of the papaw varies considerably in south-eastern Queensland, depending largely upon when the fruit is harvested. Fruit which matures in April and May is usually very palatable. This is probably due to the fact that growth and development is almost entirely confined to the warmer months of the year when soil moisture is usually adequate. As temperatures fall through June, July and August, so the flavour of the flesh deteriorates. It improves from October onwards and is usually satisfactory for the rest of the harvesting period.

Plate 2.

Reduction of Foliage during the Winter is Common in Papaws in South-East Queensland.

Plate 3.

Young Papaws Established in the Protection of a Sugar Cane Windbreak.

The trees are growing in the Redlands District near Brisbane.

Plate 4.

Young Papaws Mulched with Sudan Grass in the Redlands District.

Protection from Cold.

To ensure satisfactory plant growth and the production of good quality fruit, some precautionary measures must be taken in southern Queensland to protect the crop from cold winds. Where it can be done, the plantation should be established on a north to north-east slope.

In addition, if the area lacks natural protection by standing timber, provision should be made for the planting of windbreaks (Plate 3). Such windbreaks are effective for a distance equal to approximately 10 times their height.

Under normal circumstances, two-row strips of cane can be planted on the western, southern and eastern boundaries. The northern side of the area planted to papaws is left open. Additional breaks at 2-chain intervals within the plantation and at right angles to the normally most destructive winds may be needed. Such windbreaks should give maximum protection against all harmful winds.

The windbreaks are most conveniently established in spring prior to a February-March planting of papaws. They should then be sufficiently high by the following winter to afford reasonable protection to the crop.

Cane windbreaks, apart from protecting the papaw plants from cold winds, are also very useful sources of mulching material. The cane is normally ratooned in the spring and the surplus material can be placed among the trees as a surface mulch. Papaw plants respond well to the application of such a mulch which helps to conserve soil moisture, suppresses weed growth and maintains the organic matter supply in the soil (Plate 4).

These effects have a material bearing on fruit quality in the papaw plantation.

SUPER. AND LIME BOOST CLOVER GROWTH.

Agriculture Department trials in the coastal areas of south-eastern Queensland have again shown that dressings of superphosphate and lime will produce good clover growth. Given sufficient soil moisture, establishment of clovers in the dairy pastures of the south-eastern district seems to be a question of applying the correct type and amount of fertilizer. At present, it appears that super. and lime play the leading roles.

Mr. S Marriott, Chief Agrostologist in the Department, said that, in trials carried out in previous seasons, spectacular clover growth had resulted from using super. at 10 cwt. to the acre. It was felt that this rate of fertilizer application was not justified.

The recent clover fertilizer trials on coastal dairy pastures were designed to determine the rates and types of fertilizer necessary for clover establishment and maintenance.

On a sandy soil type at Carbrook normally devoid of legumes, yields from clover planted this season were increased six-fold in plots treated with 4 cwt. of super. and 10 cwt. of lime to the acre. At Cooroy, on a heavy clay soil, clover yields were increased four-fold. Both these soil types were highly acid with low levels of available soil phosphate.

The Tower and Circular Pit Silos

By Officers of the Agriculture Branch.

The reinforced concrete tower silo is usually the most costly type to construct. A more expensive plant is required to fill it than is necessary for an underground silo. The greater depth of silage in a tower silo usually gives greater compaction and consequently a greater weight per cubic foot than in trench silos, except of course in the surface layers. A well constructed tower silo, however, is a permanent asset.

Plate 1.

Tower Silos in Course of Construction on the South Coast.

Capacity of Tower Silo.

The usual practice is to make the height of the silo approximately double the diameter of the silo. For example, a silo 14 ft. in diameter should be 28 ft. in height.

The height of the silo above ground can be reduced if desired by excavating and building a portion underground.

TABLE 1.

Approximate Capacity of Round Silo in Tons.

Inside Height.	Inside Diameter of Silo.						Cubic Feet of Silage to the Ton.
	10 ft.	11 ft.	12 ft.	13 ft.	14 ft.	15 ft.	
Ft.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	
20	28	34	40	47	55	63	56
21	29	36	42	50	58	66	56
22	31	38	45	53	61	71	55
23	33	40	47	55	64	74	55
24	35	42	50	59	68	78	54
25	36	44	52	61	71	82	54
26	38	46	56	65	76	87	53
27	40	48	58	68	78	90	53
28	42	51	61	71	83	95	52
29	44	53	63	74	86	99	52
30	46	56	67	78	91	104	51

Plate 2.

Completed Tower Silos.

The cost of construction is influenced largely by the distance that materials, particularly sand and metal or river gravel, have to be carted, and by the amount of outside labour required.

The capacity of round tower silos is shown in Table 1.

Considerable assistance is given by the Department of Agriculture and Stock in the construction of tower silos. Complete details of the method of construction and of the assistance provided may be obtained on application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

Filling the Tower Silo.

Chaffed material is always used, and a blower or an elevator is necessary to fill the silo. Where the forage harvester is used, only a blower or an elevator is necessary. If the entire plants are cut in the field with a reaper-binder and hauled to the silo, a cutter-blower is needed.

During filling operations one person should be stationed inside the silo to keep the chaffed material evenly distributed and well trampled, especially against the wall. If the chaffed material is falling from the top of the silo without the use of a guide tube, the heavier particles drop in the centre, and the light, leafy portions drift towards the wall. If this is permitted the silage will tend to shrink from the wall, allowing air to enter and mould to develop. It is therefore essential that constant attention be paid to even distribution.

To maintain an outward pressure on the walls, it is advisable to keep the material heaped slightly higher in the centre. When filling has ceased for the day, all who are assisting with the work should enter the silo and thoroughly trample the material. Filling should be continued each day until the silo has been filled.

If operations are unavoidably held up, the top layers will deteriorate quickly if left exposed to the air. It is advisable to cover with a layer of finely-chopped succulent grass several inches in depth, or something equally suitable, such as sawdust. The temporary covering layer should be removed immediately before filling is resumed, care being taken to see that no material showing signs of mould is left. The same care is necessary where a protective covering has not been used.

When the silo has been filled, a layer approximately 12 in. in depth of some fine-stalked, succulent material should then be added and spread evenly over the surface as soon as possible. If well trampled, this forms a dense, mouldy mass which will prevent the entry of air. When suitable green material is not available, wet chaff or sawdust may be used. Even though the limited clearance between the fixed roof and the top of the silo makes the job difficult, sealing off should be well done.

Heavy material will consolidate the top layer of silage but it is not an easy matter to convey the required amount of earth or stones to the top of the silo. Depending on circumstances, it may be preferable to devote more time to trampling the top few feet of silage and the protective covering.

Emptying the Tower Silo.

When it is intended to commence feeding the silage to stock, the mouldy covering material and the top layer of silage which has been in contact with it should be removed. If the material has been thoroughly trampled, the quantity of silage which has become mouldy will be negligible. Usually the removal of a layer a few inches in depth is all that is necessary.

Silage deteriorates when exposed to the air for any length of time, and each day's requirements should be taken from the whole of the surface

to a depth of at least two inches. This prevents exposure of any silage for more than 24 hours.

Little time is required each day in removing and replacing a cover, so the use of one is recommended to assist in keeping the silage in a succulent condition. It can be made from canvas or similar covering material.

MAKING A CIRCULAR PIT SILO.

Provided a suitable site is available, it is not necessary to concrete the whole of a circular pit silo. All that may be required is a concrete collar 4 in. thick and 5 ft. 6 in. deep. The usual practice is to have portion of the collar projecting above ground level. Thus all risk of storm water finding its way into the silo is eliminated.

The collar type of circular pit silo is unsatisfactory where ground water may enter and where the soil walls may fall in. In such cases, it is necessary for the whole pit to be concrete lined. Therefore careful selection of the site is required.

The collar type of circular pit silo is mainly suited to deep volcanic soils, such as those of the Atherton Tableland. With constant use, the earth sides become smooth and polished, and where the soil is well drained seepage is usually not a problem.

It is essential that the wall of the collar type of circular pit silo be kept plumb below the collar and smoothly trimmed to ensure even settling of the material. Cavities in the wall cause the adjacent silage to deteriorate. By using an iron rod and batten, no difficulty should be experienced in keeping the wall plumb where the subsoil of the site is suitable.

Plate 3.

Silage Blower with Auger Feed Hopper Attached.

Provided the silo has been properly constructed on a site where there is no danger of water seepage, silage of the best quality can be made in the collar type of circular pit silo and kept for many years in splendid con-

dition. This type of circular pit silo can be more cheaply constructed than either the tower type or the completely concrete-lined circular pit silo. Moreover, no outlay on a blower or elevator is required, as is the case with the tower type.

The completely concrete-lined circular pit silo costs about the same as the tower silo to build but the cost of a blower or elevator for filling is not incurred. Equipment is needed for emptying the silo but is less expensive.

The capacity of this type of silo can also be obtained from Table 1.

Cutting and Carting.

In filling the pit silo, the crop may be cut and chopped in the field, using a forage harvester, or it may be cut with a reaper-binder or mower, then loaded onto a truck or waggon and hauled to a chopper or chaff-cutter at the side of the pit.

As the forage harvester, with trailer, permits the whole job to be done by one individual, the value of this equipment is obvious.

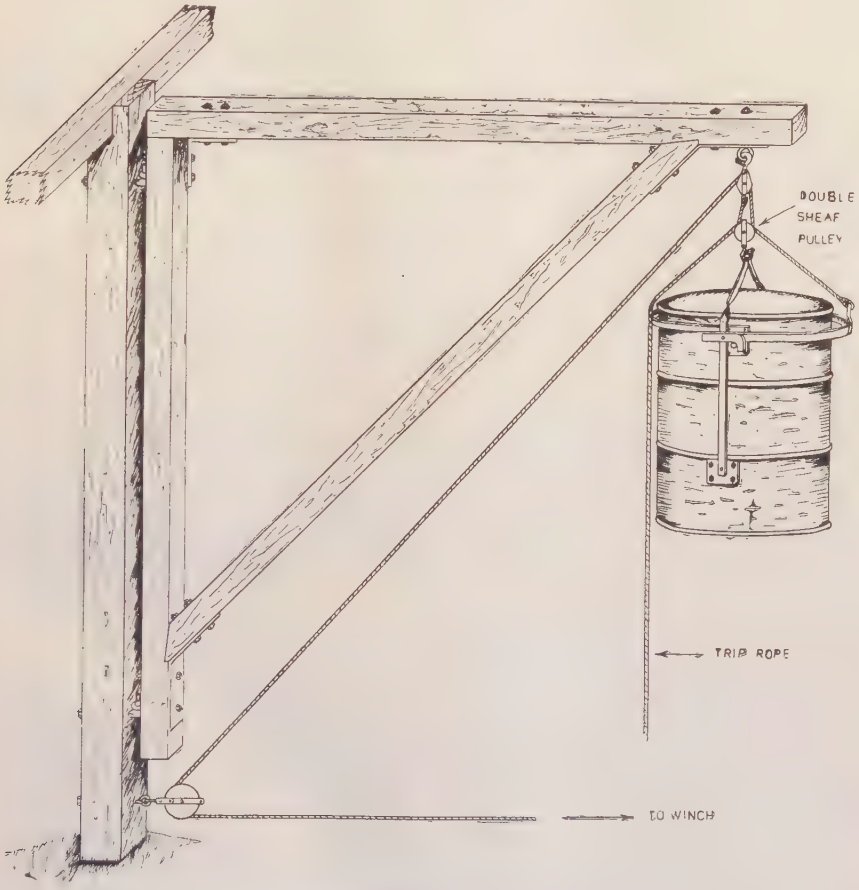


Plate 4.

Hoist and Self Emptying Drum for Use With Pit Silos.

Filling the Pit Silo.

The same methods of spreading and trampling should be adopted when

filling a circular pit silo as when filling a tower silo. Heavy material to provide additional pressure may be applied with less trouble to the pit than to the tower silo.

As the pit silo is covered either by a high shed or a low sliding roof, it is possible to thoroughly trample the material at a higher level than is the case with the tower silo.

Emptying the Pit Silo.

The removal of silage from either type of circular pit silo requires more time and labour than is the case with a tower silo.

A hoist is necessary. A type with a self-emptying drum has proved satisfactory and can be constructed very cheaply. Removal of the silage should follow the same procedure as in the tower silo. Similar precautions to keep the silage in a fresh, succulent condition should also be adopted.

STUDYING NATIVE PASTURE MANAGEMENT.

Research workers in Queensland have begun a large-scale trial to determine the best method of managing the State's native pastures. Its aim is to clear up some of the problems facing beef producers who, in the main, rely solely on native pastures. The trial has been set up at "Brian Pastures" Pasture Research Station.

Commenting on the trial, Dr. W. A. T. Summerville Chairman of the "Brian Pastures" Technical Committee, said its outcome could have far-reaching effects on beef production in Queensland.

Although the establishment of sown improved pastures is speeding up, there are still about 350 million acres of native pastures in the State. Establishment of sown pastures is likely to continue to be a gradual process and then only on specialised types of country. So it can be assumed that for many years the bulk of Queensland's stock will be raised on native pastures.

For this reason, any work that will help stock owners to understand the effect on grasslands of different forms of management will be of value.

The trial will seek answers to many questions about the management of native pastures. For instance, are present management practices making the best use of the grass crop? Will different management reduce the amount of black speargrass in favour of the blue grasses? If this happens, will it improve pasture productivity?

An area of 150 acres, cut up into five 30-acre blocks, has been set aside for the study. One block is being given the normal treatment for the district—continuous grazing, no subdivision and annual burning. Another is being managed in the same way except that half is being contour-chisel-ploughed each year after burning.

A third block has been subdivided into four paddocks and has been given over to rotational grazing in an orderly fashion. In another block, a small area of lucerne has been established and stock will have access to this in a rotational grazing programme.

The fifth block has been subdivided into four paddocks and each will be treated in a different manner in succeeding years. In an effort to get away from annual burning, burning will be alternated with mowing for hay or heavy grazing for short periods to cope with excess grass growth.

More Milk From Good Machine Milking

By E. B. RICE, Director of Dairying.

Good milking practices enable the dairy cow to yield to her maximum capacity under the prevailing feeding conditions, and save time in the shed. Faulty milking lowers milk yields and may induce cows to become slow milkers.

The man, the milking machine and the cow are all interdependent in attaining the desired objectives of speedy, complete let-down of milk. The purpose of this article is to deal with some of the main features in this three-fold co-operation.

In a shed where a well organised, systematic milking routine has been developed, thorough and hygienic milking methods are not sacrificed, but the milking of a large number of cows hourly per man can still be achieved.

THE MAN.

Investigations in some other countries and in Queensland have shown that a saving of about 20 per cent. of time spent on milking is readily possible on many farms.

Two minutes less per cow daily, or one hour with a 30-cow herd, would enable the time saved in the milking shed to be devoted to productive work aimed at better feeding, or other aspects of herd management which will increase production.

This saving is largely controllable by the dairy-farmer, although the efficiency of the machine also plays its part.

Method and system count if the dairyman is to do his part well. Everything should be in readiness before milking begins. Cows should be trained to enter the bails. They should be kindly and quietly treated, and they must be stimulated to let down their milk. The teatcups must be promptly removed as soon as each cow is milked out. Each cow must be allowed to go out for grazing as soon as she is released from the bails.

A well planned cowyard and good milking shed design are important aids to speedy, efficient milking. A shed constructed to avoid stooping by the milkers is a modern trend to allow faster and easier work. These objectives are attainable with the "herring-bone" type of shed which is attracting widespread interest.

Allowing for bailing-up and udder preparation, at least nine cows per set of teatcups per hour represents good milking practice, whether in the conventional "walk-through" milking shed or a "herring-bone" shed. The efficiency of milking rate will depend chiefly on the number of sets of teatcups which each person efficiently manages during milking.

In a "herring-bone" design, provided there is no feeding in the bails, each person can comfortably work with five or six sets of cups, or milk 50–60 cows per hour, while in a "walk-through" shed three sets of teatcups per person, or about 25–30 cows per hour, would represent good practice. It is thus seen that the advantage of the former type of shed is really due to the greater number of sets of teatcups conveniently handled per person.

A farmer who milks a herd of more than 40 cows and who contemplates the erection of a new shed should give consideration to a "herring-bone" design. If he proposes to renovate an existing shed, he should consider modifying it to this design. Even with smaller herds, although there is no appreciable saving of time, the work

is easier in an "elevated" shed. The modification is usually practicable without the necessity for enlarging the building.

Any necessary information or advice can be obtained by inquiry from your local Dairy Officer.

THE MILKING MACHINE.

The milking machine, including rubberware, must be in sound repair if production of the cows is not to be adversely affected and time is not to be lost in the shed.

The rate of milking by the milking machine itself is governed mainly by the control of vacuum within the machine, pulsation ratio and the tension of the teatcup liners.

The vacuum within the machine depends chiefly on three factors:

(1) A vacuum pump which gives adequate air displacement.

(2) A machine which is free from air leaks in various parts, such as pipe joints, rings and flaps.

(3) A vacuum control (relief) valve which is reliable and sensitive.

An accurate vacuum gauge enables the farmer to observe if the vacuum is too low; such a condition decreases the speed of milking. Generally, the vacuum is 15 inches for straight inflations and 13 inches for the heavier moulded type.

The tiny air admission hole in the claw must be free from any obstruction which may impede the free entry of air during milking, otherwise the milk will not be lifted up the milk dropper tubes to the milk line.

The pulsators of the machine should be adjusted to give a ratio of squeeze to release of between 50:50 and 25:75; the best ratio is 30:70.

The tension of the rubber teatcup liners (inflations) should be such that they are taut, but not over-stretched.

Perished or fat-saturated inflations also slow down milking. Moreover, if the lips of the inflations are torn or flabby the teatcups may fall off and the noise and sudden drop in vacuum will disturb not only the cow concerned but all others in the shed.

Equipment for the testing of milking machines is now available. During the past two years Field Officers of the Division of Dairying have used such equipment for checking the mechanical condition of machines on Queensland farms. Many of the machines tested were found to have developed defects which impaired their efficiency. They extracted milk from the cows, but maximum recovery could not be expected.

By rectifying faults, the mechanical efficiency of many machines can be restored. Milking then becomes faster, second let-down by the cow may be avoided, more milk is obtained, and hand-stripping can be eliminated with all but an odd cow. These are, of course, only possible if there is equal efficiency by the man in the proper training and conditioning of the cows for good milking.

The results of a preliminary survey during which 296 machines were tested are set out in Table 1.

TABLE 1.

Results of Tests of Milking Machines.

	No. of Machines.	Percentage of Total.
Number working satisfactorily	43	14
Pulsators needing attention	127	42
Vacuum pumps faulty	110	37
Excessive air leaks	58	19
Faulty releasers	31	10
Faulty vacuum control valves	69	23

It will be seen that only 43, or 14 per cent., of the machines were in good mechanical condition.

The chief causes of faulty operation were the pulsators, vacuum pumps, vacuum control valves and air leaks. The last three defects all result in inadequate air flow through the machine, which slows up milking rate. Perished or fat-saturated rubberware was also frequently observed. Many machines had more than one fault.

THE COW.

Most cows will milk out in about five minutes, but individuality plays a role here. The average time in a New Zealand investigation was actually $4\frac{3}{4}$ minutes. The structure of the teat orifice is probably the major factor influencing the cow's milking rate.

The whole question of training cows is basic to the efficiency of machine milking. Vigorous washing of the udders, preferably using running water, is the most effective way to stimulate the cow to let down her milk rapidly and to give the maximum amount compatible with the feeding conditions she enjoys.

Unfortunately, water supplies on many Queensland farms are not abundant enough to enable running water to be used for udder washing, but effective use of available supplies will help to ensure adequate stimulation.

Recent New Zealand research has clearly shown that the milk yields of cows, well managed in other directions, are higher when good milking methods are employed.

Five sets of identical twin cows were used, all being subjected to similar feeding and milking, excepting the stimulation for milk let-down. One twin from each pair had the teatcups placed on as soon as she entered the bails, while the other had its udder washed vigorously, squirts taken from each teat and the teatcups put on 40 seconds after starting the stimulation.

The average production for the lactation period for the five twins whose milk let-down was stimulated was 16 per cent. higher than that of their co-twins. In one pair the difference was as high as 36 per cent.

Allowing for the comparatively small number of cows, and the varying effect of stimulation on individuals, the investigation suggested that a really efficient milking procedure is capable of improving the production of a herd by over 10 per cent.

MACHINE STRIPPING.

Machine stripping is another aid to simplifying the milking routine, reducing labour and saving time. Information given to me during an overseas visit last year indicated that hand-stripping after machine milking has almost completely ceased in Britain. Reports from New Zealand reveal that few farmers there now hand-strip. The many Queensland farmers who have given away hand-stripping all agree that they would never go back to it.

Good milking techniques and a machine in sound mechanical condition are prerequisites for successful machine stripping. In particular, the cows must be properly stimulated to let down their milk, the cups gently pulled down towards the end of milking if they tend to creep up towards the base of the udder, and the teatcups removed as soon as the cow is milked out.

Training of the cow for machine stripping should preferably commence at her first lactation, while older cows may be trained from the onset of a new lactation. Abandonment of hand-stripping thus involves the man, the cow and the machine working efficiently and in harmony.

Investigations have shown clearly that hand-stripping is unnecessary. Production is unaffected, cows do not dry off earlier, the chance of spreading mastitis by the milkers' hands is lessened, milking is less tedious, and time is saved. Milk quality may also be improved, as hand-stripping often increases contamination.

SUMMARY.

The goal of getting as much milk as possible from the cow in the least time can be achieved if attention is given to the following major factors in milking methods:—

(1) Avoid any hold-up during milking by having everything prepared and ready before milking begins.

(2) Handle the cows quietly in order to eliminate leg-roping; back chains may be convenient.

(3) Maintain the milking machine in efficient mechanical condition and operate it according to the manufacturer's instruction manual.

(4) Stimulate the cow to let down milk rapidly and completely by using a strip-cup to check the foremilk and by vigorously washing the udder.

(5) Place the teatcups on the cow about 40–60 seconds after starting stimulation.

(6) Machine strip by carefully pulling down the teatcups towards the end of milking.

(7) Remove the teatcups as soon as the cow is milked out.

CROSS-BREEDING WITH DAIRY-TYPE ZEBUS.

A plan to breed Zebu-cross dairy cattle in tropical Queensland has been drawn up by the Agriculture Department.

This year, dairy-type Zebu bulls and British breed cows will be mated to start a long-term project aimed at testing the value of Zebu-cross dairy cattle. It could even result in the development of a new tropical dairy breed.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said his Department has obtained four young milking-type Zebu bulls for this work. Two are purebreds—one a Red Sindhi and the other a Sahiwal. The other two are the first cross between the Sahiwal and the Jersey.

These animals are the progeny of milking-type Zebu cattle imported into Australia some time ago by the C.S.I.R.O. They will be the first dairy-type Zebus to be introduced into Queensland.

The young bulls, which are all Australian born, have been given exacting disease tests in Southern States. When they arrive in Queensland, they will be given further tests.

It is planned to use the bulls to form the nucleus of an experimental herd on the tropical coast. Present plans suggest that the herd will be established at the State's tropical research station, the Bureau of Tropical Agriculture, South Johnstone.

If this cross-breeding experiment is successful, the hybrid progeny could help to solve the problem of milk shortage in northern and western Queensland.

Mr. Madsen said Queensland was fortunate in obtaining dairy-type Zebu bulls, and his Department appreciated the gesture by the C.S.IR.O. in making them available. This co-operation was making it possible to commence work with dairy hybrids in tropical Queensland.

Good Results With Cheese-milk by Water Tower Cooling

By F. G. FEW, Dairy Technologist.

For the cooling and holding of milk for cheese manufacture, evaporative cooling on the farm has given very good results and has been the subject of demonstrations on farms throughout the cheese-producing areas of the State.

A system of cooling and holding milk and cream on the farm, with resort to only natural evaporative cooling, has been used fairly extensively in Queensland for many years. Recently the application of refrigeration to farm cooling has become established but, despite this fact, evaporative cooling still has important applications. As a supplement to refrigeration important running economy can be achieved with natural cooling while, in some fields, it has been shown to give quite satisfactory results when used alone.

In the following, consideration has been given to the results obtained on 20 such farms using the water-cooling tower method, installations being provided from funds granted under the Commonwealth Dairy Industry Extension Grant.

Results have been considered from the viewpoint of cooling efficiency achieved, including divergencies and their causes, and milk quality. Some general recommendations were made from the results of the demonstrations.

COOLING EFFICIENCY.

The provisional standard on which cooling efficiency has been based is that the milk-in-can temperature should not exceed the existing wet-bulb reading by more than 5 deg. F. Admittedly, this standard allows of little tolerance as the cooling water cannot be cooled below the wet-bulb temperature, and even a margin of several degrees in this respect is usually allowed when evaluating tower-cooling efficiency. Another factor is the impossibility of cooling the milk to the cooler intake water temperature, a margin of even 2 deg. F. not being considered excessive. The cooled milk has also to cool down the receiving can from the atmospheric temperature which can be considerably above the wet-bulb reading, particularly at the evening milking during the summer months. Typical results are given in Table 1.

TABLE 1.

COLLATED COOLING DATA FROM 19 FARMS.

Farm No.	No. of Observed Milkings.	Average Divergence of Cooled milk (°F.)	Average Divergence of milk without cooling (°F.)
1 ..	15	3·6	23·0
2 ..	31	4·9	27·6
3 ..	24	7·5	19·8
4 ..	23	7·6	23·3
5 ..	56	5·4	18·2
6 ..	12	6·2	25·1
7 ..	12	4·3	22·6
8 ..	9	9·8	..
9 ..	25	5·1	18
10 ..	5	6·3	24
11 ..	10	4·6	27·1
12 ..	4	5·4	30·5
13 ..	10	4·5	22·1
14 ..	11	3·8	18
15 ..	20	5·4	22·8
16 ..	10	4·8	23·2
17 ..	10	4·5	23·9
18 ..	8	7·1	24·7
19 ..	4	6·4	23·9

The results show clearly the importance and value of cooling on the farm as reflected in the high average temperature differences of uncooled milk as compared with cooled milk.

CAUSES OF INEFFICIENT COOLING.

Faulty Cooler.

On two farms, a scaled-up milk cooler was responsible for poor heat transference over a part of the test period. After a thorough internal cleaning the cooling efficiency was raised to within the provisional 5 deg. F.

The results stress the importance that must be attached to the use of only the most efficient types of coolers for milk-cooling on the farm.

Effect of Low Water-Milk Ratio.

On another farm a check on the data received showed a low water/milk ratio, most values lying within the 2·5-4·5 range. Efficient cooling was not achieved until the water/milk ratio was 6. The avoidance of a low ratio is thus imperative for cooling efficiency.

MODIFIED WATER-COOLING DEVICES.

Mention has already been made of the necessity to use only efficient types of milk-coolers to ensure satisfactory results under practical farm conditions. Attention will now be given to certain other items of equipment used in the installations tested.

The standard louvred wooden tower was used on 15 of the total number of 20 farms so far considered, the design being basically that fully described in Pamphlet No. 4 of the Division of Dairying, entitled "The Cooling and Holding of Milk and Cream on the Farm."

In the case of five installations a modified design was employed, the louvred sides being replaced by complete board (or other) coverings thus giving a natural up-draught tower.

Water pits were also constructed in some cases above the ground level thus eliminating the need for excavation, while, in some instances, pits were placed within the dairy premises and used for storing cans of milk overnight.

In this design a tray was used to catch the water leaving the tower, ordinary 2-in. galvanised down-piping being used to allow the water to gravitate to the internal pit. The water was drawn from the pit for circulation through the milk-cooler and then delivered to the top of the tower for subsequent cooling.

Of the 42 per cent. of installations, where the average temperature differences of the cooled milk did not exceed the provisional standard, that is, was not more than 5 deg. F., six utilised standard louvred towers and two the modified boarded-in type.

The results obtained with both types of construction showed a reasonably comparable efficiency.

However, the standard louvred tower had an average temperature advantage of 1 deg. F. over the completely enclosed type, this being deducted from water-off-tower temperatures as compared with the prevailing wet-bulb readings.

In some enclosed installations the deviation varied from 2 deg. F. to 4 deg. F. whereas 2 deg. F. is usually the maximum for an efficiently operating standard type tower. On the other hand some enclosed installations operated with an efficiency quite equal to the standard type. It was, however, noticeable that the enclosed type lost cooling efficiency more quickly than the standard type if taxed beyond normal capacity. Overloading, of course, cannot be condoned with any design.

Generally, however, there is no doubt that the enclosed design can be constructed more easily and probably more cheaply, and the results show that comparably good cooling efficiency can be expected.

WATER-PITS.

With regard to water-pits, whether simply for the collection of cooled water of for overnight can storage or a combined usage, there appears to be no efficiency advantage. The type of construction advised depends mainly on local conditions and particularly on the farmer's requirement and convenience.

An internally constructed water trough for can storage, that is within the dairy premises, has the advantage of normally requiring no roofing and/or other protection, but has no advantage or disadvantage from the viewpoint of cooling efficiency.

RECOMMENDATIONS.

The following recommendations can be made from the study of the cooling results:—

(1) The tower must comply with the general specifications given in the official pamphlet, including the louvred sides or boarded in to the same extent as an alternative. No substitute for tower baffles is permissible as water-cooling efficiency is dependent on surface area exposure of water to air. The number of baffles—four—must similarly be insisted upon to give the necessary area in relation to tower height and required rate of water flow over the tower.

(2) A good type of surface water cooler with a maximum surface area and offering a minimum resistance to water flow is essential.

(3) Water pumping must be efficient and the use of a vee belt drive is much to be preferred. The ratio of water circulated to milk cooled must not be less than six and, as the tower is designed to cool 6 gallons of water per minute, the milking rate should not be in excess of 1 gallon per minute or 60 per hour. Total quantities of milk, of course, do not matter provided the rate stated is not exceeded.

(4) Although a hard water supply is not in itself inimical to efficient cooling and should not, in general, result in scale deposition as temperature changes are small, an occasional inspection is necessary to ensure no scaling up. In the cooler this will interfere with heat transfer and will impede water flow should it occur anywhere within the circulating system. Extraneous matter should be kept out of the system as far as possible by the efficient screening of water at the footvalve pump intake.

MILK QUALITY IN RELATION TO COOLING.

Although milk-cooling efficiency can be evaluated in terms of temperature reduction, its value on the farm is frequently gauged in terms of milk quality. The confusion caused by this error can be dispelled if it is remembered that milk quite unfit for consumption, cheese-making or any other use, can be cooled just as efficiently as a first quality product. The low quality milk would still be useless, whereas the cooling process might be very efficient. Any accurate correlation between milk quality and cooling can, therefore, only be attempted when a quality product is available. Cooling has no mystical power to improve poor quality.

A record has been kept of methylene blue reduction times and milk temperatures on all cheese-milk producing farms in the demonstrations under review.

The cooled evening milk has been stored on the farm in an extension to the water pit below the cooling tower, a water trough constructed within the dairy premises as an alternative to a tower water pit, or simply within the dairy premises. For comparison, a normal can of milk, collected without resort to shock cooling, was stored within the dairy premises.

Samples were taken from the cans on arrival at the factory next morning and milk temperatures were also recorded. A similar procedure was adopted for the cooled morning milk, comparing it with a normal can of milk taken without resort to cooling.

In general the results show the advantages of milk cooling, reduction times, for the moment, being regarded as indicative of milk quality. In most instances, the methylene blue reduction times of the cooled milk were double that of the uncooled milk.

The benefit of cooling the evening milk is particularly noticeable in the results from certain farms, especially during the summer months. This, of course, is of considerable significance as the maintenance overnight of the quality of evening milk is perhaps the item of most importance in raising cheese quality (cheese being made from the blended evening and morning milk).

During the cooler months the difference in quality is less marked. As can be expected it is also less in the case of the morning milk supply, a slight advantage, nevertheless, being the general result.

With morning milk it was also found that test times for cooled and uncooled milk were good and did not differ greatly if farm hygiene was satisfactory whereas, on the other hand, a definite disparity occurred when hygiene was not satisfactory.

In the latter case cooled milk gave a lower, although still satisfactory, test time, while the uncooled milk test was not always satisfactory.

In other cases where the standard of hygiene was very low and completely unsatisfactory, tests on both cooled and uncooled morning milk indicated very poor milk quality. Therefore the conclusion is inescapable that a high standard of dairy hygiene is imperative for the maintenance of milk quality by the cooling method employed. With poor hygiene the milk is highly "seeded" (contaminated) at the outset resulting in a low methylene blue test despite cooling.

As the reduction in milk temperature is limited, and approximates to 70 deg. F. in the summer months, every precaution is necessary in thoroughly cleaning and sterilising farm equipment; whereas, with milk cooled to lower temperatures, for example around 50 deg. F., quality is more easily maintained and can withstand possible weaknesses in production methods.

Economically, however, it is considered that the benefit given by the tower cooling system for cheese milk fully justifies the little extra cleaning effort demanded, quite apart from the further consideration that no standard can be too high where food production is concerned.

EFFECT OF COOLING ON CHEESE QUALITY.

During 1954-55 cheese manufacturing trials were carried out on tower-water-cooled milk, using uncooled milk for comparison. The cheese was subsequently graded after 2 to 3 weeks and then, after storage, at intervals of 3 months and 6 months from the date of manufacture. The average advantage in grading points scored by the trial cheese increased with time, being 0·5 at the first grading, 1·5 at 3 months and 2·0 at 6 months. Results were in close agreement at each trial and the averages given can be considered as reasonably indicative of the improvement in cheese quality effected by utilising the water-cooling tower system.

EFFECT IN RELATION TO METHYLENE BLUE TEST.

Finally, it may be pertinent to comment very briefly on the methylene blue test—quality relationship. Apart from extending the life

of the milk as reflected in a longer methylene blue time, efficient farm cooling as recommended retards the development of bacteria causing undesirable fermentations and encourages types which cause desirable fermentations in dairy products.

COST OF EVAPORATIVE COOLING.

The average cost of cooling devices under consideration is, of course, dependent on the type of materials used in their construction, farm situation and availability of materials locally. Generally the initial capital cost has averaged between £70 and £90 per unit. Once established, maintenance costs are negligible although periodic painting of the timber is desirable and will help extend the working life of the unit. Normally at least 10 years' good service can be expected with reasonable care and attention. On this basis and calculating on 50 gallons of milk daily, the cost of water cooling does not exceed ¼d. per gallon.

FAT LAMBS FROM IRRIGATED PASTURE.

Irrigated pastures at the Gatton Regional Experiment Station are turning off export quality fat lambs in less than three months. The stocking rate is about 12 ewes and their lambs to the acre.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said that this was another example of the versatility of irrigated pastures. These highly productive and highly nutritious pastures have already proved their worth in dairying with annual milk yields that would return £200-£300 an acre if marketed as wholemilk. Irrigated pastures are also showing promise as grazing for beef cattle.

In last year's fat lamb trial, the second carried out on the irrigated pastures at Gatton, the Border Leicester-Merino cross ewe flock was mated with Southdown rams. The ewes lambed mainly in August at the rate of 121 lambs for each 100 ewes mated, compared with an 81.6 per cent. lambing in 1956.

The ewes and lambs were grazed full time on irrigated pastures. While rain-grown pastures were sparse and dry, irrigated pasture yielded heavily and it was not necessary to feed supplements to the ewes and lambs.

The first draft of lambs was marketed 63-78 days after lambing. The 50 lambs that were slaughtered up to the end of October dressed out at an average of 33 lb. and all carcases were of high quality. The dressed weight was 52.5 per cent. of the paddock weight.

Mr. Madsen said the results of the two trials are encouraging. They clearly show the potential of irrigated pasture for fat lamb production and indicate that the industry could be greatly expanded in coastal districts unsuitable for running wool-growing merinos.

The Gestation Length of Australian Illawarra Shorthorns in Queensland

By A. R. McTACKETT, Cattle Husbandry.

Studies have shown that with A.I.S. cattle there is no constant gestation length. It is wise therefore to keep cows under close observation from at least 1 week before 9 calendar months have elapsed since last service.

The gestation length of cattle is usually taken to be about 9 months. When estimating expected calving dates, some dairymen use 9 months plus 10 days from the date of service as a guide. This means that cows mated on January 1 should calve on October 11.

The breeding records which have already been supplied by dairy farmers co-operating with the Department of Agriculture and Stock in the Herd Breeding Survey can be analysed to determine the length of gestation. As there is little information available on the gestation length of the Australian Illawarra Shorthorn, a study has been made of the records derived from 22 of these farms with stud and highly graded A.I.S. herds.

NORMAL GESTATION.

In studies of gestation in cattle it is now usual to regard those of less than 270 days as short, and the calf as premature. When gestations of over 300 days occur it is possible that a service has been missed or not recorded. Hence only those gestations from 270 days to 300 days are regarded as normal.

In the records examined there were 1,050 normal gestations and a further 31 of less than 270 days. It is possible that some of these short gestations terminated with the birth of a calf suitable for rearing. But it is also likely that such calves were premature. However, some of them may have been conceived at a service previous to the last one recorded. Investigations carried out overseas have shown that about 3 per cent. of cows may come on heat after they have conceived. Gestations of less than 270 days have not been included in the analysis.

TABLE 1.

PARTICULARS OF 1,050 A.I.S. GESTATIONS.

Gestation Length (Days).	Percentages of Calves.		
	Bull Calves.	Heifer Calves.	All Calves.
270–275	3·5	6·0	4·7
276–280	14·1	14·8	14·3
281–285	32·5	42·1	36·3
286–290	32·0	27·7	30·4
291–295	12·6	7·3	10·2
295–300	5·3	2·1	4·1
Total	100·0	100·0	100·0

The maximum length of gestation is more difficult to fix. Prolonged gestations have been reported from several countries. In this analysis a further service has been assumed where gestations of over 300 days occurred and these have been excluded. The question of arriving at a maximum length for gestation is one which is worthy of further research and one which is of vital importance to all herd breeding societies.

TABLE 2.

GESTATION TABLE FOR A.I.S. CATTLE.

(based on a gestation of 284 days)

Month of Service.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Day of Mating.	Find date of Service in column on left. Move across table to the right to the column for month of Service. The figure is date due during month immediately above.											
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	12	12	10	10	9	12	11	12	12	12	12	11
2	13	13	11	11	10	13	12	13	13	13	13	12
3	14	14	12	12	11	14	13	14	14	14	14	13
4	15	15	13	13	12	15	14	15	15	15	15	14
5	16	16	14	14	13	16	15	16	16	16	16	15
6	17	17	15	15	14	17	16	17	17	17	17	16
7	18	18	16	16	15	18	17	18	18	18	18	17
8	19	19	17	17	16	19	18	19	19	19	19	18
9	20	20	18	18	17	20	19	20	20	20	20	19
10	21	21	19	19	18	21	20	21	21	21	21	20
11	22	22	20	20	19	22	21	22	22	22	22	21
12	23	23	21	21	20	23	22	23	23	23	23	22
13	24	24	22	22	21	24	23	24	24	24	24	23
14	25	25	23	23	22	25	24	25	25	25	25	24
15	26	26	24	24	23	26	25	26	26	26	26	25
16	27	27	25	25	24	27	26	27	27	27	27	26
17	28	28	26	26	25	28	27	28	28	28	28	27
18	29	29	27	27	26	29	28	29	29	29	29	28
19	30	30	28	28	27	30	29	30	30	30	30	29
		Dec.							July.			
20	31	1	29	29	28	31	30	31	1	31	31	30
	Nov.				Mar.	Apr.	May.	June.		Aug.	Sept.	Oct.
21	1	2	30	30	1	1	1	1	2	1	1	1
22	2	3	31	31	2	2	2	2	3	2	2	2
			Jan.	Feb.								
23	3	4	1	1	3	3	3	3	4	3	3	3
24	4	5	2	2	4	4	4	4	5	4	4	4
25	5	6	3	3	5	5	5	5	6	5	5	5
26	6	7	4	4	6	6	6	6	7	6	6	6
27	7	8	5	5	7	7	7	7	8	7	7	7
28	8	9	6	6	8	8	8	8	9	8	8	8
29	9	..	7	7	9	9	9	9	10	9	9	9
30	10	..	8	8	10	10	10	10	11	10	10	10
31	11	..	9	..	11	..	11	11	..	11	..	11

The distribution of the 1,050 normal gestations for A.I.S. cows of all ages is shown in Table I. Gestation length has been grouped into periods of 5 days and the incidence is given for bull calves, for heifer calves and for all calves.

The figures in the table show that two-thirds of all the gestations terminated from 281 days to 290 days after the last recorded service. Based on an expected gestation of 9 calendar months, a period which varies from 273 days to 276 days, less than 5 per cent. of these gestations fell within the range. If 10 days are added the range then becomes 283 days to 286 days. During this period 32 per cent. of the calves were born indicating that for estimating expected calving date 9 months plus 10 days from the date of service is a useful guide.

A higher proportion of heifer calves than bulls were carried less than 281 days but a higher proportion of bull calves than heifers were carried from 291 days to 300 days. Approximately 21 per cent. of heifers were carried from 270 days to 280 days against 9 per cent. from 291 days to 300 days.

The average length of the 1,050 gestations was 284.9 days. For 397 bull calves the average was 285.6 days and for 337 heifers 284.1 days. Bull calves were carried on the average 1½ days longer than heifer calves.

The greatest number of bull calves (8.8 per cent.) was born on the 285th day and the greatest number of heifer calves (11.3 per cent.) on the 284th day. Of all the 1,050 calves the

highest percentage born on any one day was only 9.2 per cent., this being on the 284th day.

From these figures it can readily be seen that there is no constant gestation length. It is therefore wise to keep cows under close observation from at least one week before 9 calendar months have elapsed since last service. By doing so it may be possible to save the lives of those cows which have unexpected trouble at calving and also to save some of the calves that are born weak or, as sometimes happens, meet with an accident at or soon after birth.

A gestation table based on an expected gestation for A.I.S. cattle of 284 days is shown. (Table 2.) As an example of how to use the table, a cow served on May 11 would be due on February 19. If service occurred on November 25, the date of expected calving would be September 5, changes for the month due occurring in the body of the table.

FERTILIZER DOUBLES COTTON YIELD.

Nitrogenous fertilizer almost doubled the yield from irrigated cotton crops at Biloela last season, the Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) has announced.

In trials at the Biloela Experiment Station, plots treated with sulphate of ammonia at 4 cwt. to the acre yielded 2,570 lb. of seed cotton an acre. The yield from untreated plots was 1,364 lb. an acre.

The fertilizer was applied in two dressings, each of 2 cwt. an acre. The first was given about eight weeks after planting when the first squaring was noted, and the second about seven weeks later following a three-inch irrigation.

At this moderately heavy rate, fertilizing was an attractive financial proposition, despite the high cost of the sulphate of ammonia. Fertilizing lifted the net return by £29 10s. an acre. With seed cotton bringing 14d. a lb., the dressing of 4 cwt. an acre increased the gross return by £70 an acre. Expenses amounted to £40 10s. an acre—£10 10s. for the fertilizer treatment and £30 for the extra picking and handling charges.

Lighter applications of sulphate of ammonia—2 cwt. an acre at different stages of growth—gave only small yield increases. The response did not justify the financial outlay.

It is important to note that the trial was carried out under irrigation and on land on which a response to nitrogenous fertilizer was to be expected. The soil was a fairly heavy grey alluvium which had been under cultivation for 21 years. Irrigated cotton had been grown for the last five years and there had been some reduction in nutrient status due to leaching and physical soil changes.

Mr. Madsen said further experiments are planned to test the value of urea as a source of nitrogen for cotton. On the basis of available nitrogen, urea is a slightly cheaper fertilizer than sulphate of ammonia.

TIMELY HINT ON LUCERNE.

It is a common complaint that in Queensland we have no satisfactory pasture legume. For large areas of south-east and central Queensland this is not true.

There are large tracts of country where lucerne can be successfully grown either alone or in pasture mixtures.

Plantings of lucerne in pasture mixtures at rates as low as 1 lb. per acre have been successfully grazed on a rotational basis for up to 6 years without damage to the stand. Outstanding examples can be seen at Mundubbera, Maclagan, Kaimkillenbun, Baking Board and Texas. Use lucerne as a pasture legume.

A Portable Tubular Steel Cattle Crush

By F. H. D. MARSHALL, Technical Officer, Division of Animal Industry.

The portable steel crush is fire- and vermin-proof; it can be taken down quickly and transported to another site; its width and spacing of the rails can be varied to suit the type and size of cattle being worked.

For some years cattlemen in the north-western and south-western parts of Queensland asked the question: "Is it possible to design a strong portable cattle crush for temporary attachment to 'broncho' yards for jobs requiring close handling of large mobs of cattle?"

In these areas where labour and suitable timber supplies have always presented a big problem in yard-building, it was felt that a portable crush, which could be moved from yard to yard on big holdings, would be considerably cheaper than the construction of a conventional timber crush at each yard.

In 1954 the Department of Agriculture and Stock as part of its plan for the control of contagious pleuropneumonia, commenced a field extension service in which officers visited properties throughout the endemic areas of the State, assisting and advising graziers in preventive inoculation programmes.

The lack of suitable crush facilities prevented the introduction of a regular plan of inoculation on many properties and the need for a portable crush became more urgent.

Plate 1.

A Broncho Ramp on a Property West of Thargomindah. Many holdings where this type of ramp is used have no crush facilities.

DEPARTMENT PLANNED FIRST CRUSH.

The first experimental crush of tubular steel and scaffold fittings was erected at Yeerongpilly Research Institute in September, 1954, to plans and specifications prepared in the Department.

Mainly because of considerations of weight this prototype was only a three-panel, four-rail structure, with rails overlapping at the uprights. This crush is illustrated in Plate 3.

Four crushes of this type were made available to extension officers and their practical value was soon demonstrated.

Graziers were quick to realise that an answer to their query had been found and crushes of this design began to find their way on to station properties.

One big pastoral company procured sufficient material for seven five-railed crushes for use on its holdings in south-west Queensland.

inoculated. The result was very pleasing as the cattle worked better with the crush, packed up tighter, and in general all who saw it were impressed."

The main disadvantage found with the early type of crush was the overlapping of the rails at the uprights, as the fittings sometimes caused abrasions to cattle. This has been

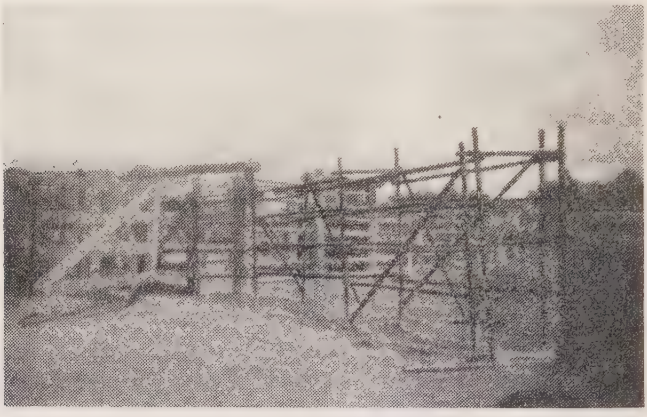


Plate 2.

The Prototype Tubular Steel Crush Attached to the Round Yard at "Currawilla" in South Western Queensland.

One grazier, after having inoculated more than 2,000 cattle for C.P.P. in his crush, reported to his extension officer, "With reference to the steel cattle crush I have to advise that we are most pleased with it; no breakages, and only very small calves can get out. This crush holds the biggest bulls."

On another property over 1,000 cattle were bled in four days with the help of a portable steel crush.

One extension officer reported, "This piece of equipment is a great asset to the cattle industry and can be recommended to hold and work all types of cattle."

Another officer advised that, "The crush was easily erected, the time taken being two and a half hours. Cattle were found to crush up quite well, possibly better than in an orthodox timber crush. This may be attributable to the greater amount of light showing between the rails . . ."

A further report stated, ". . . 180 head of weaner heifers were

corrected by fitting the rails end-on to the uprights as illustrated in Plates 4 and 5.

The advantages of the crush are: The portable steel crush is fire- and vermin-proof; it can be taken down quickly and transported to another site for re-erection; its width and the spacing of the rails can be varied to suit the type and size of cattle being worked.

Specifications of Crush.

2-inch Tubular Steel.

Ground plates—4 x 9 ft. (plus 4ft. extension of No. 1 plate to gate upright).
Uprights—11 x 7 ft.
Rails (5 rail crush)—30 x 8 ft.
Stays (at rear only)—4 x 6 ft.
Braces (and panels only)—4 x 10 ft.
Headstocks—5 x 4 ft.
Gate hanger—1 x 8 ft.
Gate brace (top of upright to frame)—1 x 10 ft.
Connecting pieces (tops of uprights)—4 x 1 ft. 6 ins.

Plate 3.

The First Experimental Crush Erected at Yeerongpilly Animal Research Institute in October, 1954. The early method of attaching the rails by overlapping at the uprights is clearly shown. This method has since been changed to an end-on fitting between the uprights.

Plate 4.

The Latest Crush Erected at the Animal Husbandry Research Farm at Rocklea. The method of fitting the rails and the slide gate is clearly depicted.

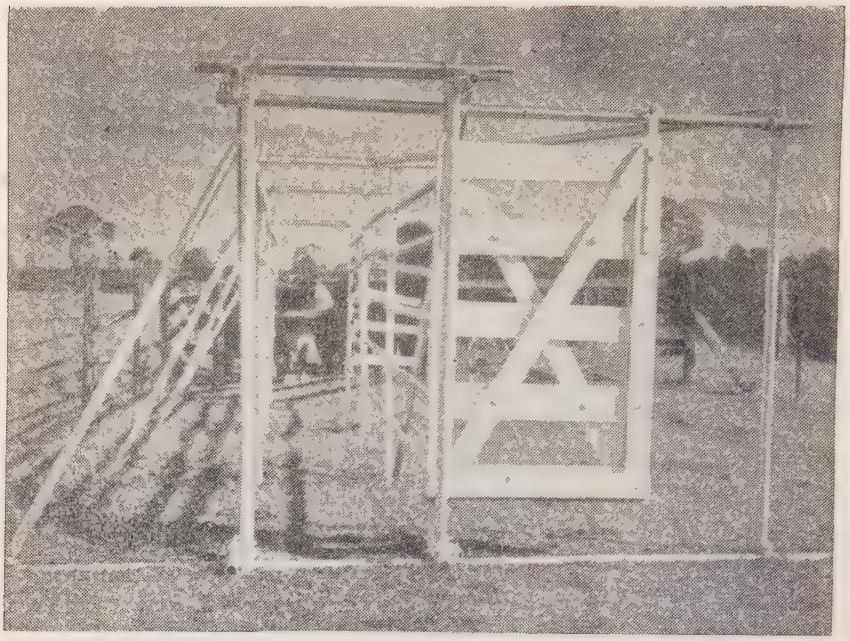


Plate 5.

End-on View of Latest Crush. This photograph shows the method of staying the crush at the rear, and the attachments for the simple slide gate. The gate shown was cut down from one used previously in an old timber crush on the farm.

Pegs at end of rear stays/ground plates)—4 x 2 ft. 6 ins.

Fittings.

Putlog clips (for joins at right angles, e.g. headstocks and ground plates to uprights)	33
Swivel crosshead clips (for joins at any angle; mounted internally in stays and braces for attachment to uprights)	18
Fixed crosshead clips (for joining rail ends to uprights)	60
End-to-end coupler (for extension of No. 1 ground plate to gate upright).	1

Tools.

Special type "swingover" spanner	2

(All these patent fittings and tools are procurable from Mills Scaffolds Ltd., Brisbane).

Weight of Crush.

Weight of the 3-panel, 5-rail crush is approximately 16 cwt.

Price.

Cost of the materials and tools is approximately £100 in Brisbane. (The cost of a timber gate is not included in this figure.)

METHOD OF ERECTION.

Two men are required to erect the crush, the back section of which is erected first.

The ground plates are laid in shallow trenches to ground level, care being taken that they are square to the line of the crush and parallel to each other to ensure fit of the rails.

The uprights are placed about 4 ins. to 5 ins. in the ground and clipped to plates and headstocks; top and bottom rails are placed in position to test correctness of spacing.

The rear stays are fitted as each panel is erected. This is important to avoid collapse of a heavy panel and possibly injury to workmen.

The front section of the crush is then erected and tied to the rear section by the headstocks.

The gate hanger and stay are attached as illustrated.

Use This Ration-guide for the Feeding of Pigs

By Officers of the Pig Branch.

We look to the brood sow to produce two large and thriving litters each year.

Good feeding of the in-pig sow benefits the unborn piglets also, for their birthweights will be higher than otherwise would be the case. High birthweights give piglets better prospects of survival and vigorous growth.

The amount of pigmeat produced at weaning depends on the number of piglets in the litter that survive to weaning, and the weight of each piglet at that time.

The Maiden Sow.

The maiden sow is a growing animal and should be fed accordingly. Six or seven pounds of meal or its equivalent should be fed daily from approximately six months of age and during the first pregnancy.

	Per day.
If dry-fed ..	1 lb. meatmeal 5 lb. crushed grain
If milk-fed ..	1-1½ gallons skim milk 5 lb. crushed grain
If whey-fed ..	3 gallons whey ½ lb. meatmeal 5 lb. crushed grain
If garbage-fed	3 gallons garbage 3 lb. crushed grain 1 lb. meatmeal

Gilts should not be mated before they reach a liveweight of 250 lb. and are eight or nine months old. This is important because too early mating may stunt their growth, especially if feeding is not the best.

The Pregnant Sow.

During pregnancy the piglets in the sow's uterus grow from the size of a pinhead to 2 or 3 lb. weight. The unborn litter makes demands on the sow for nourishment and unless provision is made for this in the sow's ration she will have to supply it from her own body reserves. Nature ensures that the growing, unborn litter has first priority where nutriment is concerned and so the litter's requirements must be met before those of the sow.

The pregnant sow, therefore, requires extra food in her ration.

The piglet's body is composed mostly of protein and so towards the end of pregnancy the sow with an average litter has about 20 lb. of protein stored in her uterus. The extra food required by the sow should clearly be protein-rich. The protein-rich food supplied must be adjusted to allow for the rapidly increasing feed demands as pregnancy progresses.

To illustrate this, the ration will be considered for three periods: early, mid- and late pregnancy. In all three, if grains comprise part of the ration it is preferable to feed a mixture of them. Grazing of good quality pasture is most desirable for sows throughout.

Where succulent pasture is available the ration may be reduced by 1 lb. of crushed grain.

(1) *Early Pregnancy*—the first 6 weeks after mating—

	Per day.
If dry-fed ..	½ lb. meatmeal 4 lb. crushed grain
If milk-fed ..	1 gallon skim-milk 4 lb. crushed grain

If whey fed ..	3 gallons whey ½ lb. meatmeal 2½ lb. crushed grain
If garbage-fed	½ lb. meatmeal 3 gallons garbage 1 lb. crushed grain

(2) *Mid-Pregnancy*—from 7th to 12th week after mating—

	Per day.
If dry-fed ..	1 lb. meatmeal 4 lb. crushed grain
If milk-fed ..	1½ gallons skim-milk 4 lb. crushed grain
If whey-fed ..	3 gallons whey 1 lb. meatmeal 2½ lb. crushed grain
If garbage-fed	2 gallons garbage 1 lb. meatmeal 2 lb. crushed grain

(3) *Late Pregnancy*—the month before farrowing—

	Per day.
If dry-fed ..	1½ lb. meatmeal 4½ lb. crushed grain
If milk-fed ..	2 gallons skim-milk 4½ lb. crushed grain
If whey-fed ..	3 gallons whey 1½ lb. meatmeal 2½ lb. crushed grain
If garbage-fed	2 gallons garbage 1½ lb. meatmeal 2½ lb. crushed grain

In late pregnancy, bran may be substituted for 30 per cent. (or lucerne chaff for 10 per cent.) by weight of the crushed grain allowance. Bran and lucerne chaff promote healthy bowel action and so the tendency for constipation at farrowing time is reduced.

The Suckling Sow.

During the course of an eight-week lactation, a sow may produce 75 gallons of milk or an average of approximately 1½ gallons a day. Feeding influences the amount of milk a sow will produce. The milk yield increases rather rapidly to a maximum in the third week, after which it decreases more slowly. Towards the end of lactation, the ration may be gradually cut back so that a week after drying-off, the sow is fed the early pregnancy ration.

During early lactation the ration should include:—

	Per day.
If dry-fed ..	3 lb. meatmeal 11 lb. crushed grain
If milk-fed ..	4 gallons skim-milk 11 lb. crushed grain
If whey-fed ..	6 gallons whey 3½ lb. meatmeal 6 lb. crushed grain
If garbage-fed	2 gallons garbage 3 lb. meatmeal 8½ lb. crushed grain

If a sow is suckling more than eight piglets, the ration should be increased by 1 lb. crushed grain for each additional piglet. During lactation, bran may be substituted for 30 per cent., or lucerne chaff for 5 per cent., grain allowance.

General Considerations.

Minerals should be fed to sows in the form of equal parts of ground limestone and salt at the rate of one per cent. of ration.

Good quality green feed is essential for sows at all times and, when supplied in large quantities, is capable of replacing one or two pounds of meal in the ration.

The general aim in feeding the pregnant sow is to have her on a rising plane of nutrition from mating onwards so that her condition reaches a peak at farrowing time. However great care should be exercised to see that a sow doesn't become too fat. The sow should be carefully watched during pregnancy and, if necessary, changes in the ration made.

Feeding the Litter.

In early life, piglets are normally dependent on the sow's milk for their nutriment, but the more vigorous may start to eat extra food—if available—from seven days onwards. While, for the production of heavy litters, it is essential that supplementary food be fed at weaning time.

The piglet is capable of doubling his weight very quickly and to assist him supplementary food known as "creep" food should be provided. The creep is a small area of the farrowing pen only accessible to the piglets and inside which a special feed is placed. The piglets should be encouraged to partake of "creep" feed as soon as possible.

Creep Feed.

If dry-fed.—Meatmeal and crushed wheat or maize in equal parts.

If milk-fed.—If a surplus of skim-milk is available, some may be fed in the creep but scrupulous attention to hygiene is essential if scouring is to be avoided.

Feeding the Growing Pig.

As the pig grows, there is an increase in body weight due to the growth of the body tissues. Bone, fat and muscle grow at different rates and at different periods.

The weaner's body is composed mostly of muscle and bone with a little fat; the porker's body is likewise mostly muscle and bone but has more fat than the weaner's; the baconer's body is mostly fat and muscle and has a relatively small proportion of bone.

Thus muscle and bone make their greatest proportional growth in the growing period, while the fat deposition is greatest in the later growing period. All tissues are growing at the same time but at different rates and so to feed the growing pig efficiently one must provide foods which will develop the tissues to their maximum potential at the appropriate time. Protein is the building block for muscle whereas starch is the building block for fat. In this regard, two factors must be borne in mind:

(*a*) The need for a decrease as age increases, in the proportion of protein fed.

(*b*) The need for an increase in the overall quantity of the ration with increasing age.

Most pigs are fed twice daily. However, young pigs will grow quicker if fed three times daily or self-fed. Up to about 6 months of age pigs require ¼ lb. of dry meal per day for each week of age, for example a 12-week-old pig requires 3 lb. of meal per day.

Dry Feeding.

The following mixtures would be suitable:—

(*a*) Weaning to 80 lb. liveweight—

	Lb.
Crushed grain	78
Meatmeal	26
Ground limestone ..	½
Salt (fine)	½

(*b*) 81 lb. to 125 lb. liveweight—

	Lb.
Crushed grain	78
Meatmeal	16
Bran, pollard or lucerne chaff	5
Ground limestone ..	½
Salt (fine)	½

(*c*) 125 lb. liveweight to market weight—

	Lb.
Crushed grain	78
Meatmeal	10
Bran, pollard or lucerne chaff	11
Ground limestone ..	½
Salt (fine)	½

Milk Feeding.

Pork and bacon may be produced on a ration consisting entirely of skim-milk. A pig can convert 4 gallons of skim-milk into 1 lb. liveweight of pork or bacon. Grain and grain substitutes may be fed with skim-milk to make an efficient profitable ration for growing pigs. In feeding value, 1 lb. crushed grain is approximately the equivalent of 1 gallon of skim-milk.

The most economical rations contain both crushed grain and skim-milk. The following rations would be the

most economical if the value of a gallon of skim-milk is rated the same as that of 1 lb. grain. The rations may be altered to suit the circumstances. For example, when the value of the skim-milk is low, part of the crushed grain allowance should be replaced with the equivalent volume of skim-milk—

(*a*) Weaning to 80 lb. liveweight—
$1\frac{1}{2}$-2 gallons skim-milk per day.
$1\frac{1}{2}$ lb. crushed grain per day.

(*b*) 81 to 125 lb. liveweight—
$1\frac{1}{2}$-2 gallons skim-milk per day.
$2\frac{1}{2}$ lb. crushed grain per day.

(*c*) 125 lb. to market weight—
2 gallons skim-milk per day.
4 lb. crushed grain per day.

Whey Feeding.

In the cheese-making areas of Queensland, whey is usually available to pig farmers in excess quantities. To use this quantity of whey, it is best to have the whey available to the pigs at most times and so it comprises most of the ration. Pigs fed to appetite on whey will not eat much concentrated food; however, some meatmeal is essential as whey is protein-deficient.

At all stages of growth the ration may comprise:

Whey fed to appetite—
$\frac{1}{2}$ lb. meatmeal per day.
$\frac{1}{2}$ lb. crushed grain per day.

Garbage Feeding.

The quality of garbage varies greatly depending on the source. Garbage and crushed grain should generally be mixed in the ratio of 1 gallon to 1 lb.

During all stages of growth, the mixture should be fed to appetite in two feeds a day.

From bacon weight, the growing boar should receive a ration fully adequate for his requirements; the quantities suggested for a maiden sow are recommended. To keep the adult boar in good working condition 1 lb. of meal for every 100 lb. liveweight would be an adequate ration. Boars do not require a high energy intake. Access to good pastures is most desirable for the working boar. It helps provide exercise and to satisfy his appetite. Bulky foods, for example, pumpkins, root crops, etc., fed in addition to his meal allowance will also help satisfy his appetite without contributing greatly to his energy intake.

A 400 lb. boar would require:—

	Per day.
If dry-fed ..	4 lb. crushed grain
If milk-fed ..	$\frac{1}{2}$ gallon skim-milk $3\frac{1}{2}$ lb. crushed grain
If whey-fed ..	4 gallons whey 1 lb. crushed grain
If garbage-fed	4 gallons garbage

All rations to be supplemented with good quality pasture.

Feeding the Boar.

The boar should not be mated till eight months of age when he is sufficiently mature to handle light, controlled matings. The boar must be well exercised and in prime baconer condition to be efficient.

PRODUCTION DURING DROUGHT.

Dairy farmers who are production-recording their herds were to a marked degree successful in combating the effects of drought last year.

The Minister for Agriculture and Stock (Hon. O. O. Madsen, M.L.A.) said this has emerged from a study of production figures in recorded herds. During the herd recording year which ended on September 30, average production per cow for a lactation period was 149 lb. of butterfat—only 6 lb. below the 1955-56 level.

Insect and Other Pests of the Hive and Honeybee

C. ROFF (Adviser in Apiculture) and A. R. BRIMBLECOMBE (Senior Entomologist).

Bees, like most other living creatures, are subject to attacks by a number of enemies. Some of these take toll of the adult bees; others attack the brood, the comb or the hive. Although depredations on living bees are of casual occurrence, damage to combs and hives can become extensive and seriously affect the beekeeper's returns. This can be largely avoided, however, by the adoption of preventive or control measures.

WAX MOTHS.

Two closely related moths, the larger wax moth and the lesser wax moth, are by far the most troublesome apiary pests in all parts of Queensland. The former is the more destructive, and although the information given below relates particularly to it, the lesser wax moth has similar habits and may be controlled by the same methods.

Life History and Habits.

Wax moths (Plate 1, figs. 5 and 6) are fawn coloured and have a wingspread of 1-1¼ in. They are most active after dusk, when the females enter hives by evading the guard bees, especially in the weaker colonies. A female may lay many hundreds of eggs, depositing them in masses in the darker places in the hive, mostly on the combs and between hive parts. The eggs (Plate 1, figs. 1 and 1 a) are very small, globular in shape and white in colour. These hatch in about eight days, giving rise to small, pale-coloured larvae or grubs, which immediately tunnel into the comb, mainly to the position of the midrib. The tunnels are evident by broken cells (Plate 2) and are lined with silken webbing which assists the grubs to evade the bees when attacked by them. Larval movements within the tunnels are plainly visible when infested comb is held up to the sunlight.

The grubs are essentially pests of beecombs, but may also damage brood, frames and the hive. By tunnelling in the region of the midrib, they destroy the bases of the cells and ultimately may cause collapse of the comb (Plate 3b). Sometimes the grubs work along the surface of the cells and expose the brood, or cause honey to leak out.

Damage is most severe in stored combs, whether in the apiary or storehouse. Infestations are also possible in active hives, where empty combs may be destroyed, brood killed and honey lost. In this way weak colonies become unproductive and eventually may be lost. In neglected apiaries serious damage soon develops and an early indication is debris blocking the hive entrance (Plate 3 a).

Larval development is most rapid in dark comb, particularly that containing brood or brood fragments. Feeding may occur on pollen cells, but more often these are avoided. Normally, the grub cannot survive on pure wax and therefore white super honeycombs and foundations are seldom attacked.

Full-grown grubs (Plate 1, figs. 2 and 2 a) are grey in colour and almost an inch in length, and in warm weather their growth is completed in six to eight weeks. The change into the pupal stage (Plate 1, figs. 4 and 4 a) may occur in the comb, but

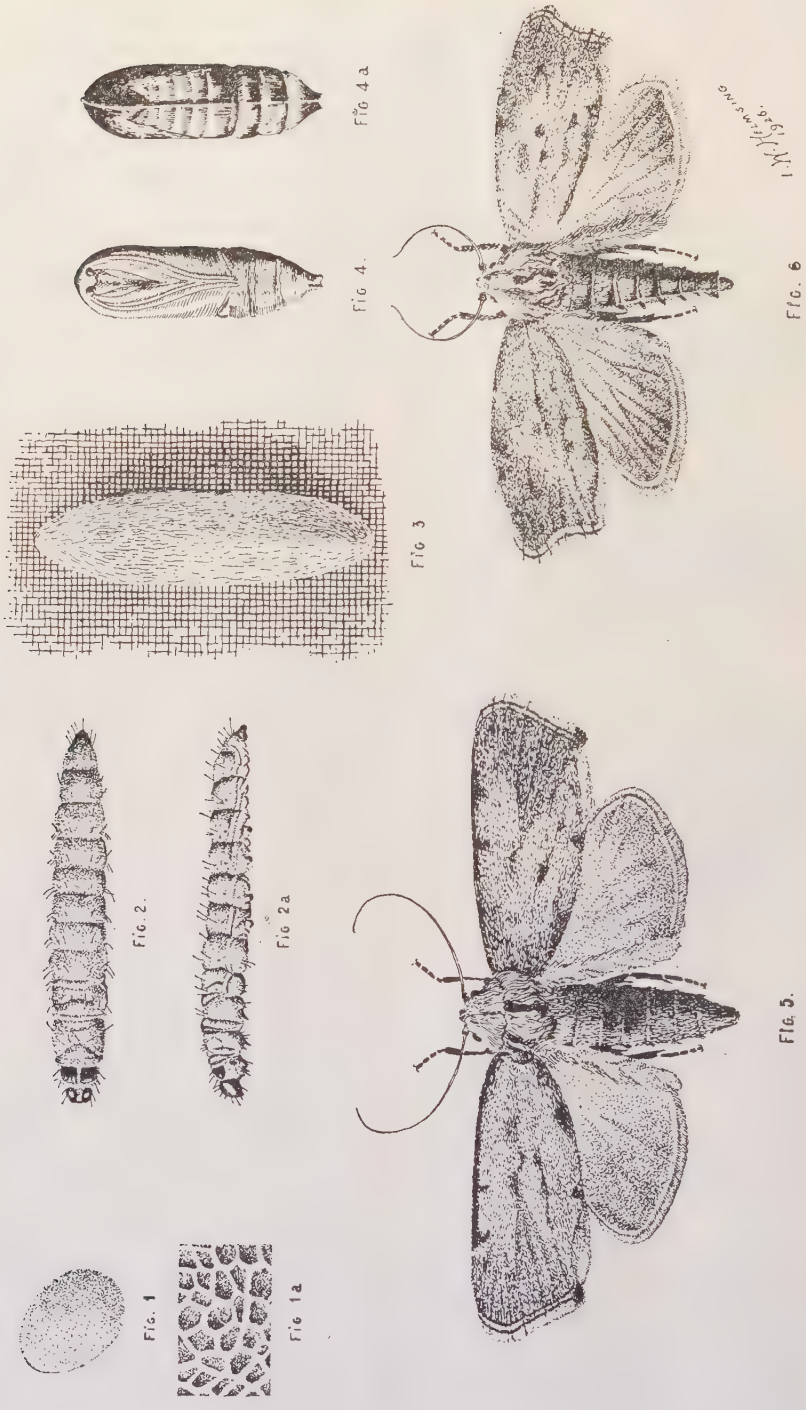


Plate 1.

Larger Wax Moth. Fig. 1, Egg x 30. Fig. 1a, Surface of egg x 210. Fig. 2, Larva, top view x 2. Fig. 2a, Larva, side view x 2. Fig. 3, Cocoon x 2. Fig. 4, Pupa, underside x 2. Fig. 4a, Pupa, top side x 2. Fig. 5, Adult female x $2\frac{1}{2}$. Fig. 6, Adult male x $2\frac{1}{2}$.

usually the grubs crawl away to form the tough silken cocoon (Plate 1, fig. 3) on the top and side bars of frames (Plate 2) or on the hive walls. Prior to forming cocoons, however, the grubs may make excavations into the wood, sometimes boring holes through the frames. The pupal period lasts about two weeks, then the adult moths emerge, mate and reinfest the combs within the hive or search for other hives.

keeping practices therefore are normally sufficient to ensure that beecombs in active colonies do not become infested.

Weak colonies rarely escape attacks and these may be determined by regular inspections. Surplus beecombs should be removed for storage and the hives scraped clean of all burr comb and propolis, which otherwise would provide protection for grubs.

Plate 2.

Beecomb Damaged by Wax Moths. Cocoons are showing on the right side of the frame.

Wax moths and their grubs are most abundant during the summer months, and it is in this period that damage is greatest. A few grubs may be present during the winter months working beneath odd pieces of burr comb and propolis in the less accessible places within the hive. Almost invariably one or more colonies in an apiary are infested, and if combs from these are directly stored either in supers or in the storehouse, damage will increase and spread quickly.

Control.

Strong colonies usually resist invasions by wax moths either by preventing the entry of the female moths or by attacking them or their grubs within the hive. Good bee-

All combs removed for storage should be fumigated with para dichlorobenzene (PDB) or carbon bisulphide. For this purpose they are placed in spare supers stacked five high in a single column with a wad of newspaper as a base to check the escape of the heavy fumes. The supers must be stacked as tightly as possible, the cracks being closed with strips of gummed paper.

When PDB is used, 3 oz. (six tablespoonsful) are spread over the frames of the top super, which is then well sealed with a pad of newspaper under a hive cover. The crystals of this material slowly change to fumes which sink through the supers, killing all larvae and moths present and also any larvae

hatching later. Reinfestation is prevented by regularly replenishing the crystals, preferably at intervals of 2-3 weeks during warm weather. PDB is non-inflammable and non-explosive.

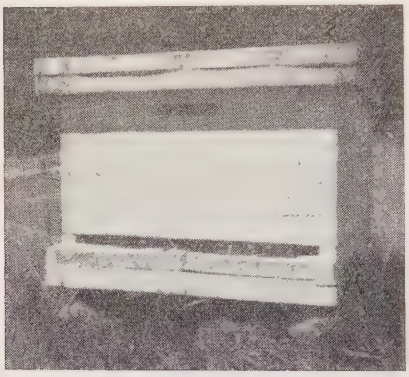
When carbon bisulphide is used, a dose of 1 fluid oz. (two tablespoonsful) is poured into a small, shallow container, placed in an empty additional super on the top of the stack; and again the whole is then well sealed with a paper pad and hive cover. This chemical kills larvae and moths as the fumes sink through the supers, but it does not remain effective sufficiently long to kill the later hatching larvae, and there is no residual repellent action against reinfestation. This treatment should be repeated at intervals of three weeks, especially during the summer.

Combs fumigated with either PDB or carbon bisulphide must be thoroughly aired before being replaced in working colonies.

Carbon bisulphide is highly inflammable and explosive. When this material is being handled, naked lights must be kept away and smoking prohibited.

ANTS.

Several species of ants often visit hives in the vicinity of their nests and take honey or pollen and even brood from the weaker colonies. Their persistence seems to cause the development of a tolerance amongst the bees and for this reason control becomes necessary. The more troublesome species are the coastal brown ant, the small black ant, and the meat ant (Plate 4), and the sugar ant (Plate 5).



a

b

Plate 3.

Wax Moth Damage. a, Wax debris blocking hive entrance. b, Damaged beecombs.

Plate 4.

Meat Ant.

Plate 5.

Sugar Ants.

The first two species are about an eighth of an inch in length and brown to black in colour. Their nests may be located almost anywhere on the ground, in the grass, or under stones, pieces of wood and other objects. The other two species are each almost half an inch in length. The meat ant has a metallic reddish-black colour. Its nests are usually conspicuous, gravel-capped mounds. The sugar ant is yellowish-black in colour and the nests occur under stones or logs.

The smaller species of ants breed quickly and may invade an apiary site. Their nests therefore are usually located under or near the infested hive. The larger species are more fixed in their nesting sites, and invade only for food.

Control.

Control of each species of ant is the same. The nest or mounds should be located and liberally watered with a solution containing 2.0 per cent. chlordane or 0.5 per cent. dieldrin. With the smaller species the treatment should include margins of several feet around the located nests, while with the larger species the solution should also be run down many of the nest openings. Periodical inspections should be made and further treatments applied when necessary. Exposed nests or mounds should be covered with old hessian sacks or grass so that the treatment will not be a danger to the bees themselves.

MICE.

During winter, mice enter storage supers or weak colonies mainly for protection. In active hives their presence disturbs the colony during the inactive winter period and they mutilate combs by feeding and nesting

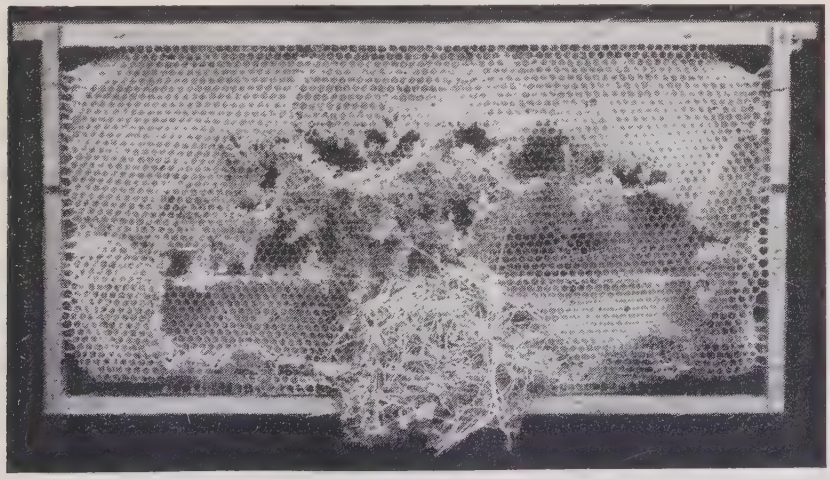


Plate 6.

Mouse Nest Built in a Beecomb. Wax moth damage is also evident.

Plate 7.

White Ant Damage to Hive.

Plate 8.

Dragon Fly.

Plate 9.
Robber Fly.

(Plate 6). If they occupy an upper super the lower ones are fouled and are unacceptable to the bees.

Control.

Strong colonies resist mice when these pests attempt to enter the hives. Other colonies can be protected by any one of the following methods:—

(1) Place a queen excluder between the brood chamber and the bottom board.

(2) Reduce the width of the entrance to three-eighths of an inch.

(3) Fasten a strip of queen-excluding zinc or wire over the hive entrance.

Supers containing stored combs should be tightly stacked and all openings blocked against entry by mice.

WHITE ANTS.

In some parts of the State, especially in the south-eastern districts, white-ants attack the hives and cause considerable damage by eating away the wood (Plate 7), particularly the bottom board, which in many instances may be resting directly on the ground. The troublesome species inhabit the soil and are not always evident by mounds.

Control.

White-ant damage can be prevented by coating the underside of the bottom boards with a pentachlorophenol solution prior to painting or alternatively by painting this surface annually with creosote.

OTHER ENEMIES.

Bees are attacked by a number of predators. Although these pests merely capture individual bees they are often persistent and are voracious feeders.

Giant toads may congregate near apiaries and snap up bees entering or leaving the hives and in this way weaken colonies. These pests can be checked by placing the hives on stands at least two feet high or by fencing the apiary with ½-in mesh wire netting.

The rainbow bird and wood swallows at certain times of the year flock around apiaries and feed upon

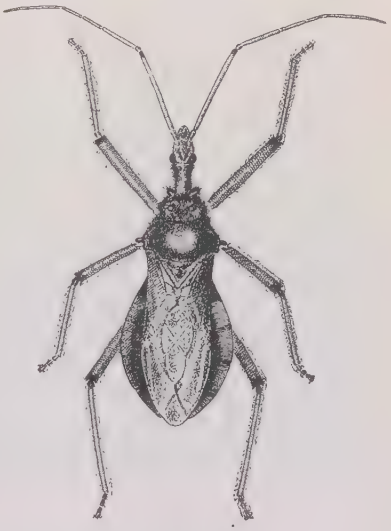


Plate 10.
Assassin Bug.

field bees. This can affect the working strength of an apiary if forage conditions are poor and brood-rearing is slow. When these birds are troublesome it is better to move the apiary to a more favourable location.

Dragon flies (Plate 8) and robber flies (Plate 9) take toll of field bees on the wing and the assassin bug (Plate 10) may seize some of those visiting flowers. The well known and venomous red back spider also captures an occasional bee.

Two species of mites occasionally invade colonies and infest the bees. Their presence irritates the bees. but does not seem to have any detrimental effect on colony strengths.

Scientific Names of Pests.

Assassin bug	*Pristhesancus papuensis* Stal.
Coastal brown ant	*Pheidole megacephala* (F.)
Dragon flies	Species of *Hemianax*
Giant toad	*Bufo marinus* L.
Larger wax moth	*Galleria mellonella* L.
Lesser wax moth	*Achroia grisella* Fab.
Meat ant	*Iridomyrmex detectus* (F.Sm.)
Mites	*Pediculoides ventricosus* (Newp.) and *Hypoaspis* sp.
Mouse	*Mus musculus* Linne
Rainbow bird	*Merops ornatus* Latham
Red back spider	*Latrodectus hasseltii* Thorell
Robber flies	Species of *Promachus*
Small black ant	*Iridomyrmex rufoniger* Lowne
Sugar ant	*Camponotus nigriceps* Sm.
White ants	*Coptotermes acinaciformis* Frogg. and *C. lacteus* Frogg.
Wood swallows	Species of *Artamus*

RHODES GRASS STANDS UP TO DROUGHT.

Rhodes grass—lucerne pastures at the Kairi Regional Experiment Station stood up so well during the recent drought that it was possible to maintain normal grazing schedules throughout that difficult period.

This is reported by Mr. W. J. Cartmill, the Agriculture Department's Director of Regional Experiment Stations. Mr. Cartmill, who recently inspected the Station, said pastures are grown there as a rotational phase in the maize cropping programme. After four years under pasture, the land is sown to maize (for grain and silage) for three or four years and then returned to pasture.

During the drought, pastures on the Atherton Tableland, in common with pastures in most parts of the State, deteriorated, and stock generally lost condition. However, the Station's Jersey herd, which was grazed on the Rhodes grass—lucerne pasture and was fed some maize silage, maintained its condition and produced at a satisfactory level.

Throughout the drought, the pasture retained good colour and succulence and was palatable to stock.

Queensland Fauna Sanctuaries

By C. ROFF, Fauna Officer.

(*Continued from page* 512, *September*, 1957.)

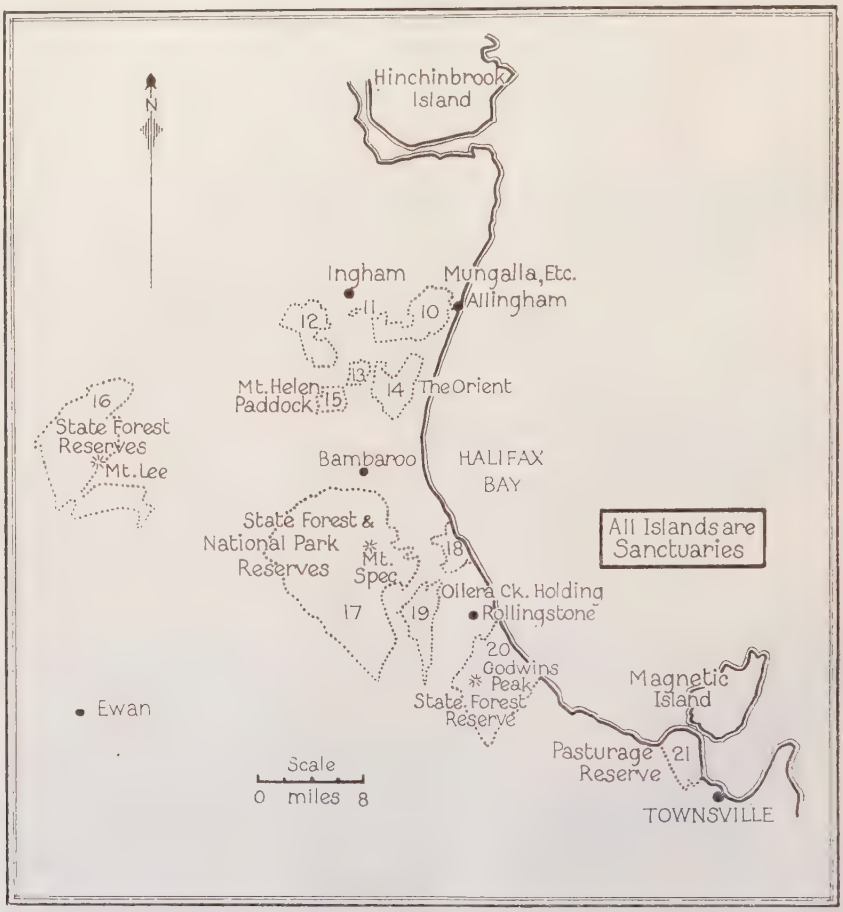
The following is an index of the sanctuaries outlined in Map 2.

SANCTUARY INDEX.

Index No.	Sanctuary.	Area in Acres.
10	Property of R. L. Atkinson, "Mungalla," Ingham	4,120
	Property of J. Allingham, Ingham	3,868
	Property of Frank Fraser Ltd., Ingham	2,000
	Properties in Ingham District	401
11	Portion 64, Ingham	106
12	Properties of A. Fraser, V. E. Fraser, F. A. Fraser and H. V. Fraser, along Trebonne Creek, near Ingham	7,779
13	Properties of T. & H. Kirkwood, Herbert River District, Ingham	2,065
14	"The Orient" via Ingham	7,700
15	Mount Helen Paddock, Ingham	3,164
16	State Forest Reserves 23 and 458, Parishes of Stone, Ashton and Ryeburn	43,620
17	Timber Reserves 28 and 268 at Paluma and Mount Spec.	65,000
	National Park Reserves 40 and 477	18,560
18	Part of Parish of Hinchinbrook	6,050
19	Ollera Creek Holding, Mutarnee	8,960
20	State Forest Reserve 34, Parish of Clemant	23,123
21	Pasturage Reserve 129, Townsville	11,616

Plate 2.

Magnetic Island, a Sanctuary Situated Off the Coast at Townsville. Koalas released on this island are now well established.



Map 2.

Sanctuaries in Part of Fauna District No. 3. The sanctuary boundaries are delineated by dotted lines.

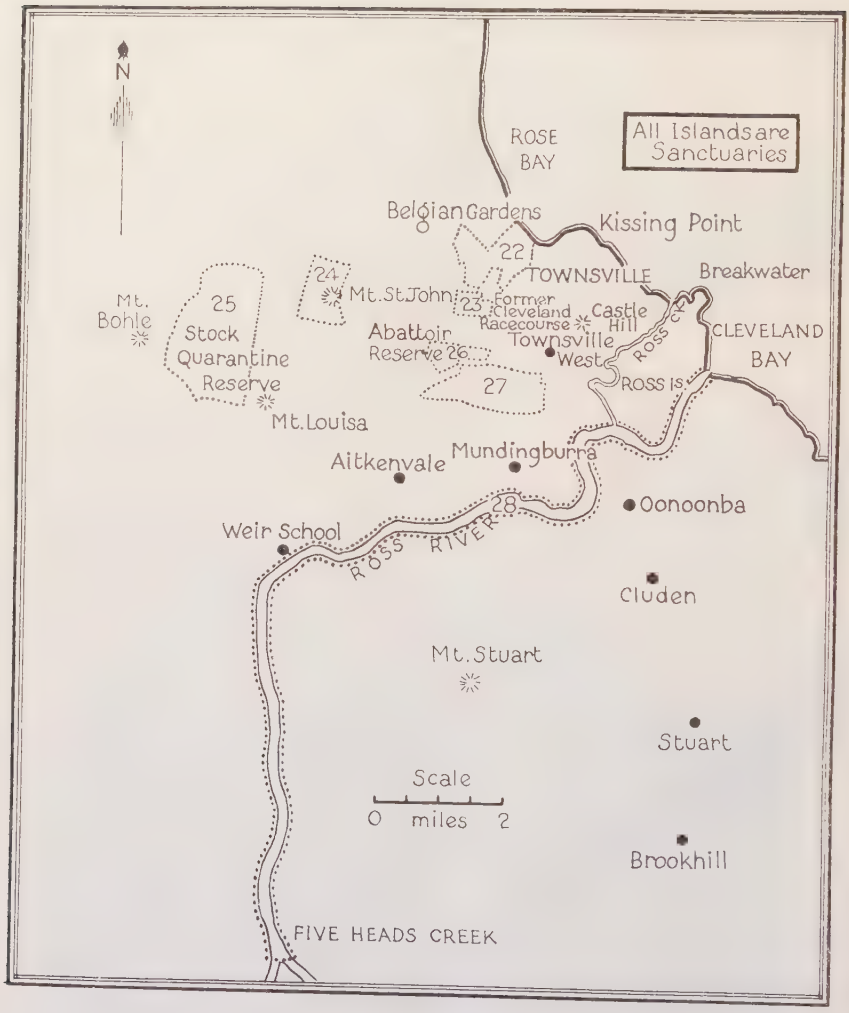
The following is an index of the sanctuaries outlined in Map 3.

Sanctuary Index.

Index No.	Sanctuary.	Area in Acres.
22	Belgian Gardens, Townsville	330
23	Former Cleveland Racecourse, Townsville	174
24	Mount Saint John, Townsville	934
25	Stock Quarantine Reserve and T. Hall's property, Bohle River, Townsville	1,550
26	Abattoir Reserve, Townsville	198
27	The property of Garbutt Bros. (Pty.) Ltd., Townsville	517
28	Portion of Ross River, Townsville	1,280

Plate 3.

Waterfowl Sanctuary, Mt. St. John, Townsville.



Map 3.

Sanctuaries in Part of Fauna District No. 3. The sanctuary boundaries are delineated by dotted lines.

[TO BE CONTINUED.]

Bagworms and Their Control

By A. R. BRIMBLECOMBE, Senior Entomologist.

Bagworms are the grubs or larvae of an unusual family of moths, and derive their name from the tightly woven bag they carry about for protection.

Four species are common in Queensland—the leaf bagworm* (Plate 1), the faggot bagworm† (Plate 2), the ribbed bagworm‡ (Plate 2), and the large bagworm§ (Plate 2).

These insects are sometimes called casemoths, but as the larval stage is normally the only one seen, it is appropriate that the common name should refer to this stage.

The leaf bagworm is the most destructive species. This feeds on a wide variety of plants, particularly young trees and coppice growth of eucalyptus. Sometimes it may be troublesome to *Pinus* species, especially radiata pine in plantations. The grubs are voracious feeders and when present in numbers (Plate 3) can cause partial or complete defoliation of trees.

Life History and Habits.

Bagworms pass through the usual four life cycle stages—the egg, the grub or larva, the pupa, and the adult.

Female moths produce many hundreds of eggs. These are not laid but hatch within the parent body inside the bag. The numerous larvae crowd through the bottom opening of the bag, crawl over the bag and onto the plant above, or let themselves down into the breeze on silken threads.

Hatching is uniform and hundreds of tiny grubs may be suspended from the one bag, which appears finally as if enclosed in cobweb.

Soon after the grubs emerge from the parent bags they bite off tiny fragments of plant material to weave into miniature upright cones just large enough to shelter the tail end of the body.

At first these cones or bags are held vertically (Plate 1). As the grubs grow, the bags are enlarged and have fragments of host leaves woven into them. Larger leaf pieces then give the bags a frilly appearance. Soon they drop behind, and are dragged along for the remainder of larval life.

While the grubs are crawling about or feeding, the head and the three pairs of legs protrude from the mouth or top end of the bag (Plates 1 and 2). Within the bag on the upwardly curved body a pair of tail-claspers and four pairs of pseudo-legs grip tightly to the silken lining to ensure the carrying of the bag and the consequent protection afforded.

At night the bags are fastened to twigs or leaves, and in the morning the threads of attachment are cut through to enable the grubs to resume crawling or feeding.

When the grubs are disturbed, the head and legs are quickly withdrawn into the bag and the mouth is tightly closed, while the tail-claspers close the bottom opening. Otherwise the bottom of the bag remains open during larval life to aid disposal of excreta and cast larval skins.

The bag is also fixed when a grub is about to moult to the next stage. Each grub moults five times; four of these enable increased growth. The fully grown grub is of stout build and mostly brown in colour. The final moult produces the pupa.

**Hyalarcta hubneri* (Westw.),
†*Clania ignobilis* (Walk.),
‡*Hyalarcta nigrescens* (Dbld.),
§*Oeceticus elongatus* Saund.

Plate 1.

Left: **Grub of the Leaf Bagworm Protruding from Bag covered with Gum Leaf Pieces.** Centre: **Bag of Leaf Bagworm with Covering of Pine Leaf Pieces.** Right: **Small Cone-like Bags of Young Bagworms on a Twig.**

Plate 2.

Left: **Bag of the Ribbed Bagworm.** Centre: **Bag and Grub of the Faggot Bagworm.** Righ: **Bag of the Large Bagworm.**

Plate 3.

A Light infestation of the Leaf Bagworm on a Pine Tree.

If the individual is a female it pupates with the head still in the upward direction; if a male the position is reversed.

The male pupa after a few weeks forces it way through the bottom of the bag and pushes out its front end, which splits, allowing the male winged moth to emerge and finally to fly away.

The female pupa resembles a shortened grub and with little further difference in appearance changes to a wingless and almost legless adult which within the bag completes its essential function by developing into a sac of eggs.

Young larvae appear mostly in the autumn and after passing through the winter continue to feed in the spring and summer. Sometimes young larvae appear in the spring although normally there is one generation a year.

Control.

Bagworms, in spite of the protection afforded by the bag, have several natural enemies especially fly and wasp parasites. These normally are particularly active and in the past have been so effective that population increases of bagworms have rarely been troublesome. Even when such increases have occurred, the parasites have eventually caused their suppression without the assistance of insecticides.

Consequently it would be better to allow some loss of leaves rather than to apply an insecticide which, in addition to cost of material, equipment and labour, would upset the parasite-pest balance for several seasons.

In some pine plantations adjacent to fruit growing districts or in farm woodlots within these districts, the extensive and sometimes excessive use of the newer insecticides for horticultural purposes has apparently reduced the general population of the natural enemies.

Nevertheless, direct control of bagworms should be avoided unless there is strong evidence, supported by a Departmental entomologist, that such control is warranted.

If an insecticide must be used it should be one not having adverse effects on the natural enemies. This limits the range of suitable insecticides; lead arsenate, however, which kills only the grubs as they eat treated foliage, may be used at a strength of 3 lb. of lead arsenate per 100 gallons of water plus a sticker (excluding oil).

TRY LONG BEANS THIS SUMMER.

Keep long beans in mind when you're preparing for the shortage of green vegetables during the hot summer months, says Mr. K. M. Ward, Senior Horticulturist, Department of Agriculture and Stock.

Queensland farmers and gardeners often neglect this easy-to-grow, palatable and heavy-yielding vegetable. Those who grow them year after year speak highly of the long bean's eating qualities.

Long beans thrive in the hottest months of the year and stand up well to bean fly attack. At this season they are therefore much easier to grow than French beans. Long beans will grow on a wide range of soils but well-drained loams with a large amount of decomposed organic matter are most suitable. Before planting, a liberal dressing of well-rotted manure can be worked into the soil. If manure is not available, you can use a 4: 15: 2 or similar complete fertilizer at the rate of 2 to 2½ lb. to the chain of row.

Sow the seed about 1 in. deep at spacings of about 10 in. in the row. The spacing between rows in single-row plantings is 3½ ft. and for double-row plantings 2 ft. with 5½ ft. centres.

Market Reports—"Why and How?"

By G. SHORT and N. H. HALL, Marketing Branch.

The "why" of fruit and vegetable market reports in Australia is to be found in the fact that there are over 90,000 producers supplying the needs of some 9 million people annually with about 1.8 million tons of fresh fruit and vegetables, the bulk of which is sold either through the six major terminal markets or at prices based upon realisations in those markets.

The function of market reports in relation to all these transactions is obvious.

Trading on the fruit and vegetable and farm produce markets in Brisbane is covered by the two daily reports issued by the Department of Agriculture and Stock. These reports have a daily circulation of 450 copies, are published in 13 different daily newspapers, and are broadcast daily through 12 radio stations. At a conservative estimate they meet the needs of 16,000 producers in this State, not to mention the many wholesale agents, merchants, retailers, public and private institutions, packing and transport agencies, etc.

The main theme of this article is the compilation of market reports. It is proposed firstly to deal with some of the general aspects of the subject; secondly, to show how reporters operate, what factors they have to consider in arriving at "market prices"; and thirdly, to elaborate upon the meaning of market terms and give some quantitative definitions of what appear to be general or relative terms.

GENERAL.

The object of the market report is to provide interested parties with up-to-the-minute marketing information. Usually, the information consists of commodity price ranges and observations regarding the general state of the market, including supply, demand, and the level of activity.

The important use of the market report will be as a guide to current transactions—hence the need for the report to be topical. It has been found in practice that the market report is put to a variety of uses according to the interests of the different groups.

For instance, the producer is interested in what his produce might have sold for, while those engaged in actual selling or buying use the report to check their efficiency and to keep in touch with commodities they might handle in comparatively small quantities or infrequently. Institutions use the report to check prices charged them and also as a guide in the selection of commodities. All groups will be interested in the state of the market and whether or not prices can be expected to hold.

The scope of market reports is wide, but a complete coverage of minor types and varieties of fruit and vegetables usually is not practicable. It is difficult to keep in touch with every commodity all the time, particularly if prices are fluctuating, and also there are limits to the time and space available for getting information to the interested parties. For broadcast purposes, the report must not be longer than can be presented unhurriedly in the time allotted. Therefore, the information must be clear and precise. Nevertheless, any item warranting relatively long comment is included, even if it means excluding other items altogether.

Broadly, the aim is to quote known price ranges, to comment upon market conditions of the major items, and to report any significant changes in the

factors of price, supply and demand. This, it is believed, leads to more market stability and through this ultimately to better overall returns to growers.

GATHERING THE INFORMATION.

Procuring the information which goes into a market report is a complex job. It requires specialised knowledge obtainable only by attendance at the markets over a long period and during the whole of peak period trading each day.

The prices are obtainable by personal contact from salesmen, Section managers and owners. In the Brisbane markets approximately 100-120 salesmen, plus as many buyers as possible, are interviewed in the three hours of trading available. The value of the report depends in a large measure on the willing co-operation of the farm produce agents in providing adequate and accurate information.

The reporter has a role to play in this by establishing goodwill. For this reason, requests for advice are met wherever possible, although information received in confidence or likely to react to the disadvantage of another is always withheld. Above all things, the reporter must maintain complete impartiality.

The large number of commodities reported and the tendency for most agents to specialise in a few commodities means that a large number of individuals have to be interviewed. It is not always possible to interview everybody, but the reporter does ensure, whatever the pressure of time, that the prices and opinions of the leading handlers of each variety of fruit and vegetables are obtained.

Apart from interviews, the reporter also has to sight sufficient produce to enable a proper appraisal of quality. It is the changing relationships between price and quality that indicate whether real values are rising or falling.

The state of supply is necessarily a matter for estimation, and it is here that continuity of attendance is important. The various methods and extended period of delivery make it impossible to obtain the actual quantities available. This is particularly so during the cooler months, when most of the vegetables are delivered by local carriers or direct by growers. Nevertheless, reliable estimates can be made with experience.

There is a basic pattern of demand in that Mondays and Thursdays are the principal local trading days, while on Tuesdays and Fridays country sales are the more in evidence. At the same time, the reporter will be on the lookout for any change in emphasis of demand from one commodity to another.

PREPARING THE REPORT.

Compilation of the report involves sorting and comparing all the items of information in order to recognise the trends and to arrive at the "market prices" of the various commodities. This operation calls for a degree of experience on the part of the reporter. This becomes readily understandable, too, when the time factor is considered.

In Brisbane it is usual for reporters to keep in touch with the markets until 10 a.m. Information with respect to interstate sales then has to be passed on by 10.15 a.m., while the complete report has to be compiled, printed and ready for despatch to radio broadcasters and newspapers by 11.30 a.m. This does not allow any lengthy marshalling of facts.

There is a general agreement in marketing circles that the market report should be based on sales, not sales on the report. However, the report is to some extent used by traders as a basis for sales, and while this is a situation not of the reporter's making, it does tend to become more widespread as confidence in the market report grows. In fact, it is a

real problem at times to know whether or not prices given represent genuine sales.

Quite often, prices given the reporter are out of harmony with quality, supply and demand, perhaps given in self interest or resulting from errors of judgment. Such prices have to be omitted, but it is not always easy to recognise them. This contingency arises mostly in relation to country or interstate sales and is the big bugbear of market reporting.

For instance, a sale may be made in good faith, but through an error of judgment, at a fictitiously high price. To include this price would give growers of similar produce an erroneous impression of the market and could lead to lower returns by inducing increased consignments. Yet, if this price is omitted it is understandable that both the salesman and the buyer might feel they have been done an injustice.

The main rules which guide a reporter in framing his report may be summarised as follows:—

(1) The phraseology and arrangement of quotes should result in an indication of values rather than a bald range of prices.

(2) The range of prices should be so broken up that the main range refers to produce of good merchantable quality. It should be as compact as possible. If the bulk of sales are of inferior, poor or very high quailty, it should be indicated.

(3) The regular use of district names is avoided, as this has been translated as a form of preference or advertising. However, there are occasions when it is necessary to refer to produce from a particular district. For instance, oranges from many widely separated districts may be selling simultaneously from as low as 16s., at a main price range of 24-30s., with specials generally to 34s. and some specials from one district at 38s. The quote would read "Oranges 24s. to 30s., specials to 34s., few (District) 38s., very large or inferior from 16s." This would enable growers to estimate what their consignments realised and at the same time meet the needs of other sections of the trade.

(4) The reporter must guard against erratic daily quotes when fluctuations are in fact caused by variations in quality from day to day.

(5) It is recognised that information regarding the state of the market, including supply and demand, can be even more important to the producer than the detailed prices information. For this reason, informative comment is prepared each day, generally with reference to the major items of produce in season, but not neglecting the abnormal changes in minor items that occur from time to time.

These comments are usually broadcast in full by the radio stations, particularly through the A.B.C. Country Hour, and this more or less "on the spot" service enhances their value immensely.

MARKET TERMS.

In most industries, there are terms in general use which have meanings peculiar to that industry. This is very much so in the markets.

As far as possible, the terms and phrases used in market reports issued by the Department in the various centres have been standardised and the meanings ascribed to some are indicated below. Even so, confusion could arise where official grade standards use different terms for similar grades of different commodities (e.g. apples, oranges and tomatoes). For this reason also, the reporter should be consistent in the terms, particularly those describing quality, although the broad meaning of such terms should be in line with the grade standards.

Some of the terms or phrases in general use in market reports are discussed below.

Quality.

In relation to quality, the following terms used in market reports should be interpreted as follows:—

"Special," "Fancy" and "Choice" are used as synonymous terms representing the very best quality. They should not be used as comparative terms when the quality is such that the best on offer does not measure up to top grade.

"Inferior" is such as meets the minimum requirements of Departmental grade standards although of an obviously low grade.

The bulk of produce which would, in accordance with grade standards, be accepted as satisfactory quality or standard grade represents the main range of quotes without descriptive qualifications.

In any consideration of quality the reporter must be careful to make the distinction from condition. Quality of a product includes size, colour, shape, texture, cleanness, freedom from defects, and other more permanent physical properties which affect its market value. Condition should include the stage of maturity, decay, shrivelling, or any other deterioration which may have occurred since the produce was harvested or may be imminent.

Quantity.

Terms used to describe quality and/or condition may be further qualified in relation to quantity by the following:—"Isolated" or "odd," "few," "some," "many," "mostly," "generally." These descriptions could be interpreted to apply within certain percentage limits, e.g.

"isolated" or "odd"	1% to 5%
"few"	5% to 10%
"some"	10% to 25%
"many"	25% to 55%
"mostly"	55% to 90%
"generally"	more than 90%

The reporter will seldom, if ever, be in possession of actual percentages and they will therefore be a matter for estimation, but experience should lead to consistency in estimates.

Individual prices that are at a very wide variance with the general rule may, if their authenticity is established, be explained by reference to quality or size, or dismissed as "few higher." Obviously low grade produce is classified as such to avoid the impression of a fictitiously low market.

Market Activity.

Descriptive words or phrases used to describe market activity are as follows:—

"Market bright" indicates a general upward trend in prices and overall confidence in such upward trends continuing.

"Market firm" indicates no marked change in values but full confidence in the maintenance of stability with plenty of buyer activity.

"Market steady" or "satisfactory" indicates no change in values; a normal market with consistent trading.

"Market quiet" indicates a period of decreasing confidence due to a fall in demand or the prospect of heavier supplies, values showing only minor reduction.

"Market dull" indicates a limited volume of trading in relation to supplies available. Commodities clearing slowly and resulting in an increasing proportion of sales low in the range of quotes.

"Market weak" indicates supplies in excess of demand and a general reduction in values to necessitate clearances.

Stronger terms such as "market oversupplied," "glutted" or "chaotic" are only used when produce either cannot be sold or can only be sold at extremely low prices.

The above market phrases are usually used in conjunction with a broad description of trading in a particular commodity. In addition, the phrases are used at the head of each report, without descriptive explanation, to cover trading generally in all commodities. In such cases the selection of the phrase is duly weighted with consideration to the main products on offer.

CONCLUSION.

From the foregoing, it might appear that market reporting has some slight air of mystery about it. Certainly it is not an exact science—else, why do opinions vary so much among members of the same section of the trade? The truth is that market prices are dynamic, the factors of supply and demand are continually changing both in total and in composition, and often it is not until we are aware of market prices, the product of their union, that the factors themselves become really apparent.

Moreover, it is the very presence of these forces of change that creates the need for market reports.

HINT ON FODDER CONSERVATION.

This Shed holds More Because the Hay is Baled.

List of Fertilizers Registered Under "The Agricultural Standards Act of 1952"

Compiled by Registration Officers of the Standards Branch, Division of Marketing.

In Queensland the sale of fertilizers is governed by *"The Agricultural Standards Act of* 1952," which provides for the registration, inspection and analysis of materials claimed to supply plant nutrients.

Before a fertilizer is offered for sale in this State, the Queensland primary dealer is required to submit an application for registration to the Standards Officer, Department of Agriculture and Stock. The information supplied in this application is carefully scrutinised to prove its accuracy and the guaranteed analysis shown on the label is checked to see that it correctly specifies the ingredients of the fertilizer.

If this information fulfils in all respects the requirements of the Act and the Regulations thereunder, the fertilizer is duly registered and may then be sold throughout Queensland in accordance with the abovementioned Act.

When offered for sale the preparation is subject to inspection by Departmental officers, who regularly sample and analyse stocks of fertilizer held by merchants as a check on the standard of commercial grades.

It is essential that materials offered for sale should comply with the requirements of the Act and every product must meet the guaranteed analysis as shown on the label. If samples fail to comply with these requirements the bulk to which they relate is withheld from sale until all deficiencies have been corrected, and legal action may be taken against the trader concerned.

A most important provision of the Act is that a clearly printed label must be attached to each package of fertilizer setting out the following information:—

(1) The name of the fertilizer.

(2) The net weight of the fertilizer.

(3) A statement setting out—

(*a*) The names and respective percentages of active constituents and the form or forms in which they occur; for example:—

4·0% nitrogen (N) as sulphate of ammonia.

2·0% nitrogen (N) as blood and bone.

6·5% phosphoric acid (P_2O_5) as bone.

6·5% water soluble phosphoric acid (P_2O_5) as superphosphate.

4·5% potash (K_2O) as muriate of potash.

(*b*) The percentage and kind of filler, if any.

(*c*) In the case of insoluble fertilizers, the degree of fineness.

(4) The name and address of the primary dealer or manufacturer.

This information is provided for the benefit of the farmer. It enables him to ascertain the contents of the fertilizer, to select a fertilizer to suit his particular requirements and to calculate the unit value of the fertilizer which is a guide to its correct price.

It is strongly recommended that farmers examine fertilizer labels closely and refuse to accept bags to which a label is not attached.

Addresses of Queensland Primary Dealers Appearing in this List.

A.C.F. & Shirleys Fertilizers Ltd.	Little Roma St., Brisbane.
Aerflo Dusts and Sprays Pty.	Bloomfield St., Cleveland.
Beckey Florists	146 Bourbong St., Bundaberg.
Jack Bishop & Co.	Capper St., Gayndah.
Blanes Woolloongabba Hardware	Logan Rd., Woolloongabba, Brisbane.
Thomas Borthwick & Sons (A/asia) Ltd.	Murarrie, Brisbane.
Cairns Meat Export Co. Pty. Ltd.	Queerah, Cairns.
The Central Queensland Meat Export Co. Pty. Ltd.	Lakes Creek, Rockhampton.
D. Cochrane	25 Targo St., Bundaberg.
Committee of Direction of Fruit Marketing	Turbot St., Brisbane.
Bill Cordiner	118 Richmond St., Maryborough.
Fertiliser Distributers Pty. Ltd.	567 Main St., Kangaroo Point, Brisbane.
Ferto Products Co.	63 Taabinga St., Wavell Heights, Brisbane.
General Fertilisers Limited	Albert St., Brisbane.
Jas. H. Harris	Geeberga, *via* Kuttabul.
G. R. Hedge	Kenna St., Chermside, Brisbane.
Houghton & Byrne (Q.) Pty. Ltd.	33-43 Hampton St., Woolloongabba, Brisbane.
Imperial Chemical Industries of Australia and New Zealand Ltd.	363 Adelaide St., Brisbane.
International Traders Pty. Ltd.	121 Jane St., West End, Brisbane.
Lamberts Pty. Ltd.	Victoria St., Mackay.
Lanes Pty. Ltd.	13-17 Lucinda St., South Brisbane.
A. Victor Leggo & Co. Pty. Ltd.	21-23 Trafalgar St., Woolloongabba, Brisbane.
Mangan Bros.	Fitzroy St., Warwick.
Walter Milne	Lannercost St., Ingham.
North Queensland Co-op. Bacon Assn. Ltd.	Moody St., Mareeba.
Queensland Meat Industry Board	Cannon Hill, Brisbane.
Queensland Nutritional Products	405 Montague Rd., South Brisbane.
H. J. Richards & Sons	62 Russell St., Toowoomba.
Shell Chemical (Australia) Pty. Ltd.	Wickham & Duncan Sts., Valley, Brisbane.
H. W. Smith, Rep. Armco (Australia) Pty. Ltd.	319-325 Queen St., Brisbane.
Swift Australian Company (Pty.) Ltd.	245 Stanley St., Brisbane.
Arch Taylor	Station Rd., Booval, Ipswich.
Teys Bros (Beenleigh) Pty. Ltd.	Main St., Beenleigh.
H. A. Webster Pty. Ltd.	57 Sydney St., Mackay.
T. H. Wood Pty. Limited	317 George St., Brisbane.
Henry H. York & Co. Pty. Ltd.	17 Brereton St., Brisbane.

Inquiries relating to this publication should be addressed to the Standards Officer, Standards Branch, Department of Agriculture and Stock, William Street, Brisbane, B.7.

Fertilizers registered in Queensland under "The Agricultural Standards Act of 1952" for the three-year period January, 1956, to January, 1959, as at 25th October, 1957.

Name of Preparation.	Guaranteed Analysis.						Queensland Primary Dealer.
	Percentage Nitrogen (N).	Percentage Phosphoric Acid (P_2O_5).	Percentage Potash(K_2O).	Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
ORGANIC FERTILIZERS.							
Bone Dust.							
FDL Bonedust	as bone 3·0	as bone 24·0	..	..	60	40	Fertiliser Distributers Pty. Ltd.
Hedge's Bone Dust	3.5	23·0	..	..	65	35	G. R. Hedge
Bone Dust	1·0	28·0	..	..	70	30	Mangan Bros.
Bone Dust	3·0	25·0	..	..	75	25	Queensland Meat Industry Board
Dried Blood.							
Bowen Dried Blood	as blood 12·0	..	..	..	74	26	Thos. Borthwick & Sons (A'asia) Ltd.
Moreton Dried Blood ..	12·0	..	..	..	74	26	ditto
Meatworks.							
Meatworks Fertilizer ..	as blood, bone & offal 3·5	as bone 24·0	..	..	60	40	Jack Bishop & Co.
Bowen Fertiliser	5·0	18·0	..	..	75	25	Thos. Borthwick & Sons (A'asia) Ltd.
Moreton Fertiliser No. 10 ..	4·5	20·0	..	..	65	35	ditto
Queerah Meatworks Fertiliser	4·7	19·5	..	..	53	47	Cairns Meat Export Co. Pty. Ltd.
Fitzroy Brand Blood & Bone Fertilizer	5·25	18·5	..	..	65	35	The Central Queensland Meat Export Co. Ltd.
FDL Meatworks	4·0	20·0	..	..	60	40	Fertiliser Distributers Pty. Ltd.
Hedge's Meatworks Fertilizer	5·5	16·0	..	..	60	40	G. R. Hedge
Lane's Blood and Bone Organic Fertiliser	5·0	16·0	..	..	60	40	Lane's Pty. Limited
Blood and Bone Fertiliser ..	5·5	14·0	..	..	85	15	Mangan Bros.
Blood & Bone	5·0	17·0	..	..	65	35	North Queensland Co-op. Bacon Assn. Ltd.
Meatworks Fertiliser ..	5·0	16·0	..	..	60	40	Queensland Meat Industry Board
Swift Milled Fertiliser ..	4·0	18·0	..	..	60	40	Swift Aust. Coy. (Pty.) Ltd.
Blood and Bone Fertiliser ..	3·9	17·0	..	..	55	45	Arch. Taylor
Blood and Bone Fertiliser ..	4·9	21·4	..	..	60	40	Teys Bros. (Beenleigh) Pty. Ltd.

INORGANIC FERTILIZERS—*continued.*

Name of Preparation.	Guaranteed Analysis.						Queensland Primary Dealer.
	Percentage Nitrogen (N).	Percentage Phosphoric Acid (P_2O_5).	Percentage Potash(K_2O).	Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
INORGANIC FERTILIZERS.							
Nitrate of Soda							
Nitrate of Soda	as nitrate of soda 16·0	..	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
FDL Nitrate of Soda	16·0	..	..	..	..	..	Fertiliser Distributers Pty. Ltd.
Suplhate of Ammonia.							
Sulphate of Ammonia	as sulphate ammonia 20·6	..	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
Home Garden Fertilizer—Sulphate of Ammonia	21·0	..	..	..	..	..	Beckey Florists
Sulphate of Ammonia	20·6	..	..	..	..	..	Blanes Woolloongabba Hardware
Cochranes Sulphate of Ammonia	21·0	..	..	..	..	..	D. Cochrane
Grow-Betta Garden Fertilizer Sulphate of Ammonia	20·6	..	..	..	..	..	Bill Cordiner
FDL Sulphate of Ammonia	21·0	..	..	..	..	..	Fertiliser Distributers Pty. Ltd.
Sulphate of Ammonia	20·6	..	..	..	..	..	General Fertilisers Ltd.
Sulphate of Ammonia	20·6	..	..	..	..	..	Lamberts Pty. Ltd.
Lane's Sulphate of Ammonia	20·6	..	..	..	..	..	Lane's Pty. Limited.
Sulphate of Ammonia	20·6	..	..	..	..	..	H. J. Richards & Sons
Shell Sulphate of Ammonia	21·0	..	..	..	..	..	Shell Chemical (Aust.) Pty. Ltd.
Urea.							
FDL Urea	as urea 46·0	..	..	..	..	..	Fertiliser Distributers Pty. Ltd.
Ureafol	46·0	..	..	..	..	..	Imperial Chemical Industries of Aust. & N. Z. Ltd.
Kwik Leaf (46)	46·0	..	..	..	..	..	International Traders Pty. Ltd.
Urea Fertilizer	46·0	..	..	..	..	..	Queensland Nutritional Products
Rock Phosphate.							
Shirleys Finely Ground Phosphate Rock	..	as rock phosphate 37·0	..	45·0 lime (CaO) as rock phosphate	95	5	A.C.F. & Shirleys Fertilizers Ltd.

Superphosphate.

		as superphosphate							
		Water Sol.	Citrate Sol.	Insol.					
A.C.F. Basic Superphosphate	..	..	17·0	2·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
A.C.F. Superphosphate	..	20·5	0·5	1·0	..	..	..	..	ditto
A.C.F. Superphosphate—Granulated	..	20·5	0·5	1·0	..	..	..	..	ditto
Home Garden Fertilizer—Superphosphate	..	20·5	..	..	..	..	..	..	Beckey Florists
Superphosphate	..	20·5	..	1·5	..	..	..	..	Blanes Woolloongabba Hardware
Grow-Betta Garden Fertilizer—Superphosphate	..	20·5	..	..	..	..	..	..	Bill Cordiner
FDL Superphosphate	..	20·5	..	..	..	..	..	..	Fertiliser Distributers Pty. Ltd.
Lane's Superphosphate	..	20·5	0·5	1·0	..	..	..	..	Lane's Pty. Limited
Superphosphate	..	20·5	0·5	1·0	..	..	..	..	H. J. Richards & Sons

Superphosphate with Trace Elements.

		as superphosphate							
		Water Sol.	Citrate Sol.	Insol.					
A.C.F. Superphosphate with Copper	..	19·5	..	1·25	..	0·9 copper (Cu) as copper sulphate	..	..	A.C.F. & Shirleys Fertilizers Ltd.
A.C.F. Superphosphate with Molybdenum	..	20·5	..	1·5	..	0·03 molybdenum (Mo) as sodium molybdate	..	..	ditto
A.C.F. Superphosphate with Zinc, Copper and Molybdenum	..	19·0	..	1·0	..	0·9 copper (Cu) as copper sulphate 0·85 zinc (Zn) as zinc sulphate 0·03 molybdenum (Mo) as sodium molybdate	..	..	ditto
FDL Super with Copper	..	19·25	..	..	..	1·3 copper (Cu) as copper sulphate	..	..	Fertiliser Distributers Pty. Ltd.
FDL Super with Molybdenum	..	20·5	..	..	..	0·025 molybdenum (Mo) as sodium molybdate	..	..	ditto

Muriate of Potash.

					as chloride of potash				
A.C.F. Muriate of Potash	..	..	..	..	60·0	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
FDL Muriate of Potash	..	..	..	..	60·0	..	..	..	Fertiliser Distributers Pty. Ltd.

Sulphate of Potash.

					as sulphate of potash				
A.C.F. Sulphate of Potash	..	..	..	..	48·0	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
FDL Sulphate of Potash	..	..	..	..	48·0	..	..	..	Fertiliser Distributers Pty. Ltd.

MIXED FERTILIZERS.

The following mixtures are arranged according to the grade formula or N : P : K. This refers to the percentages of nitrogen (N), phosphoric acid (P_2O_5) and potash (K_2O) contained in the mixture in that order and it is usually shown on labels as three figures, for example, 10–6–10. The grade formulae have been arranged in order of increasing nitrogen content, and in the case of mixtures containing similar quantities of nitrogen, in order of increasing phosphoric acid content.

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											Queensland Primary Dealer.
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
0–17·25–10·0 ..	A.C.F. Tobacco No. 9 ..	..	..	..	16·25	1·0	..	10·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
0–18·0–6·0 ..	FDL Tobacco No. 5 ..	..	..	..	17·0	1·0	..	6·0	..	0·7 magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
	FDL Tobacco No. 5 North	..	..	..	17·0	1·0	..	6·0	..	1·6 lime (CaO) as calcium carbonate	..	..	ditto
0–18·0–10·0 ..	FDL Tobacco No. 5K North	..	..	..	16·0	2·0	..	10·0	..	..	..	..	ditto
0–18·75–6·0 ..	A.C.F. Tobacco No. 5 ..	..	..	..	17·75	1·0	..	6·0	..	..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
0·25–10·5–0 ..	ACF Pasture Mixture No. 1	0·25	..	..	10·0	0·5	..	..	..	6·75 magnesia (MgO) as dolomite 10·5 lime (CaO) as dolomite 0·015 molybdenum (Mo) as sodium molybdate	90	10	ditto
0·3–10·0–0 ..	FDL Pasture Mixture No. 1	0·3	..	..	10·0	..	..	..	..	6·5 magnesia (MgO) as dolomite 10·0 lime (CaO) as dolomite 0·012 molybdenum (Mo) as sodium molybdate	..	..	Fertiliser Distributers Pty. Ltd.
1·0–8·25–25·0 ..	FDL Sugar Bureau No. 3 Planting North	..	0·5	0·5	5·5	0·25	2·5	..	25·0	6·4 lime (CaO) as calcium carbonate	90	10	ditto
1·0–8·5–25·0 ..	FDL Sugar Bureau No. 3 Planting	..	0·5	0·5	6·0	0·5	2·0	..	25·0	1·6 magnesia (MgO) as magnesium carbonate	90	10	ditto

1·0–13·75–15·0..	FDL Sugar Bureau No. 2 Planting	..	0·5	0·5	11·0	0·75	2.0	..	15·0	0·6	magnesia (MgO) as magnesium carbonate	90	10	Fertiliser Distributers Pty. Ltd.
1·0–14·25–15·0..	FDL Sugar Bureau No. 2 Planting North	..	0·5	0·5	11·0	0·75	2·5	..	15·0	2·4	lime (CaO) as calcium carbonate	90	10	ditto
1·0–14·5–15·0 ..	FDL Sugar Bureau No. 2 Planting BHC North	..	0·5	0·5	11·75	0·75	2·0	..	15·0	0·05	gamma isomer of benzene hexachloride	90	10	ditto
	FDL Sugar Bureau No. 2 Planting BHC South	..	0·5	0·5	11·75	0·75	2·0	..	15·0	0·08	gamma isomer of benzene hexachloride	90	10	ditto
1·0–15·75–10·0..	ACF Tobacco No. 7 ..	1·0	..	..	14·75	1·0	..	10·0	..		..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
1·0–16·0–6·0 ..	FDL Tobacco No. 4 ..	1·0	..	..	15·0	1·0	..	6·0	..	1·0	magnesia (MgO) as magnesium carbonate	..	..	Fertiliser Distributers Pty. Ltd.
	FDL Tobacco No. 4 North	1·0	..	..	15·0	1·0	..	6·0	..	2·5	lime (CaO) as calcium carbonate	..	..	ditto
1·0–16·0–10·0 ..	FDL Tobacco No. 4K North	1·0	..	..	14·75	1·25	..	10·0	..		..	..	..	ditto
1·0–17·5–6·0 ..	ACF Tobacco No. 4 ..	1·0	..	..	16·5	1·0	..	6·0	..		..	..	..	A.C.F. & Shirleys Fertilizers Ltd.
1·0–17·5–7·5 ..	FDL Sugar Bureau No. 1 Planting BHC South	..	0·5	0·5	14·5	1·0	2.0	..	7·5	0·08	gamma isomer of benzene hexachloride	90	10	Fertiliser Distributers Pty. Ltd.
1·0–18·0–7·5 ..	ACF K 14 X (Gam. 50)	..	..	1·0	12·25	0·75	5·0	..	7·5	0·06	gamma isomer of benzene hexachloride	85	15	A.C.F. & Shirleys Fertilizers Ltd.
	ACF K 14 X (Gam. 75)	..	..	1·0	12·25	0·75	5·0	..	7·5	0·08	gamma isomer of benzene hexachloride	85	15	ditto
1·0–18·25–7·5 ..	ACF K 14 X (Sugar Bureau No. 1 Planting)	..	..	1·0	12·5	0·75	5·0	..	7·5		..	85	15	ditto
	FDL Sugar Bureau No. 1 Planting	..	0·7	*0·3	14·75	1·0	2·5	..	7·5		..	90	10	Fertiliser Distributers Pty. Ltd.
	FDL Sugar Bureau No. 1 Planting North	..	0·5	0·5	14·75	1·0	2·5	..	7·5		..	90	10	ditto
1·0–20·25–0 ..	FDL Blood, Bone & Super	..	..	1·0	15·25	1·0	4·0	..	..		..	85	15	ditto
1·25–11·25–25·0	FDL Sugar Bureau No. 3 Planting BHC North	..	0·5	0·75	7·0	0·5	3·75	..	25·0	0·05	gamma isomer of benzene hexachloride	85	15	ditto
1·25–14·5–15·0..	ACF K 15 (Gam. 50) ..	..	1·25	..	13·75	0·75	..	..	15·0	0·06	gamma isomer of benzene hexachloride	..	..	A.C.F. & Shirleys Fertilizers Ltd.
	ACF K 15 (Gam. 75) ..	..	1·25	..	13·75	0·75	..	..	15·0	0·08	gamma isomer of benzene hexachloride	..	..	ditto
1·25–14·75–15·0	ACF K 15 (Sugar Bureau No. 2 Planting)	..	1·25	..	14·0	0·75	..	..	15·0		..	..	..	ditto
1·25–15·0–15·0..	ACF K 15 X (Gam. 50)..	..	..	1·25	8·5	0·5	6·0	..	15·0	0·06	gamma isomer of benzene hexachloride	85	15	ditto
	ACF K 15 X (Gam. 75)..	..	..	1·25	8·5	0·5	6·0	..	15·0	0·08	gamma isomer of benzene hexachloride	85	15	ditto

MIXED FERTILIZERS—*continued.*

Grade Formula.	Name of Preparation.	Guaranteed Analysis.											Queensland Primary Dealer.
		Percentage Nitrogen (N) as			Percentage Phosphoric Acid (P_2O_5) as			Percentage Potash (K_2O) as		Percentage Miscellaneous.	Percentage Fine.	Percentage Coarse.	
		Nitrate of Soda.	Sulphate of Ammonia.	Blood, Bone & Offal.	Water Sol. Super.	Insol. Super.	Bone.	Sulphate.	Chloride.				
1·25–15·25–15·0	ACF K 15 X (Sugar Bureau No. 2 Planting)	..	..	1·25	8·75	0·5	6·0	..	15·0	..	85	15	ditto
1·25–20·25–0 ..	Grow-Betta Garden Fertilizer Blood, Bone and Superphosphate	..	..	1·25	12·75	..	7·5	..	..	..	80	20	Bill Cordiner
1·25–21·0–0 ..	ACF Blood, Bone & Super	..	..	1·25	12·75	0·75	7·5	..	..	..	80	20	A.C.F. & Shirleys Fertilizers Ltd.
	Blood, Bone and Super	..	..	1·25	12·75	0·75	7·5	..	..	..	80	20	Blanes Woolloongabba Hardware
	Richard's Blood, Bone & Super	..	..	1·25	12·75	0·75	7·5	..	..	..	80	20	H. J. Richards and Sons
1·75–10·75–25·0	ACF K 16 X (Gam. 75)..	..	0·5	1·25	4·5	0·25	6·0	..	25·0	0·08 gamma isomer of benzene hexachloride	85	15	A.C.F. & Shirleys Fertilizers Ltd.
1·75–11·0–25·0..	ACF K 16 X (Gam. 50)..	..	0·5	1·25	4·75	0·25	6·0	..	25·0	0·06 gamma isomer of benzene hexachloride	85	15	ditto
	ACF K 16 X (Sugar Bureau No. 3 Planting)	..	0·5	1·25	4·75	0·25	6·0	..	25·0	..	85	15	ditto
1·8–18·5–5·0 ..	FDL Special Planting Mixture with Ferro F.T.E.	..	..	*1·8	3·5	..	15·0	5·0	..	0·8 magnesia (MgO) as magnesium carbonate 0·350 iron (Fe) 0·126 manganese (Mn) 0·160 zinc (Zn) 0·160 copper (Cu) 0·030 boron (B) 0·006 molybdenum (Mo) } as complex silicates	70	30	Fertiliser Distributers Pty. Ltd.

* Denotes nitrogen (N) derived from bone.

[TO BE CONTINUED.]